Railway Maintenance Engineer

Volume 18 CHICAGO—MAY, 1922—NEW YORK Number 5

DEPENDABLE

RAIL ANTI-CREEPERS

are preventing rail creeping on

This Excellent Track

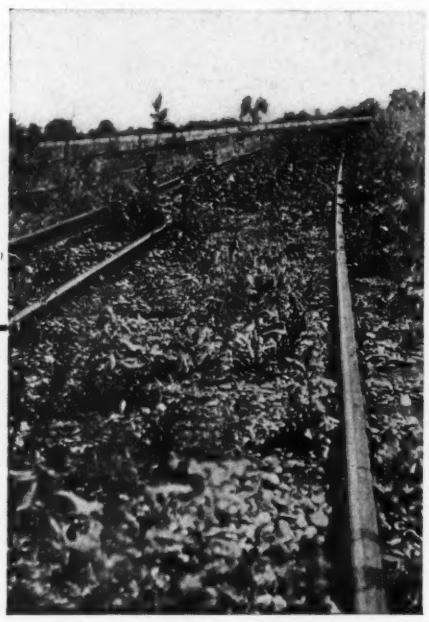
THE P. & M. CO.

THE P. & M. CO.
LIMITED
CORISTINE BLDG., MONTREAL

CHICAGO
ST. LOUIS
ST. PAUL
CINCINNATI
NEW YORK
DENVER
RICHMOND
SAN FRANCISCO

THE P. & M. CO.
(ENGLAND) LTD
31, BUDGE ROW, LONDON

Find Out First If It Pays



Before treatment, June 16, 1920

After treatment, October 26, 1920

You May Not Need Atlas A Service

Weed conditions vary to that extent that extermination costs may range from $12 to $250 per mile. If your particular problem is one of sparse growth you may be able to solve it by hand for $12 to $18 per mile and it would not pay to use Atlas A service.

If the growth is such that it costs more than that—it will pay—but find out first. The coupon below will bring this information without further obligation on your part.

If you employ Atlas A service, we do the work for the cost of chemical only. Trained men, thoroughly experienced in weed killing, make application with our own equipment, look after all details, pay cattle claims if any and guarantee results.

Whether we do it or not, the coupon will tell you what it ought to cost.

Chipman Chemical Engineering Co., Inc.

136 Liberty Street, New York City

CHIPMAN CHEMICAL ENGINEERING COMPANY
136 Liberty Street, New York City

Gentlemen:

Please send me estimate of cost per mile of Atlas A treatment based on the following conditions:—

Location (in what State) .....

Width of treatment desired .....

Kind of Ballast .....

Per cent total track area overgrown .....

Dense or sparse growth .....

RAILWAY MAINTENANCE ENGINEER
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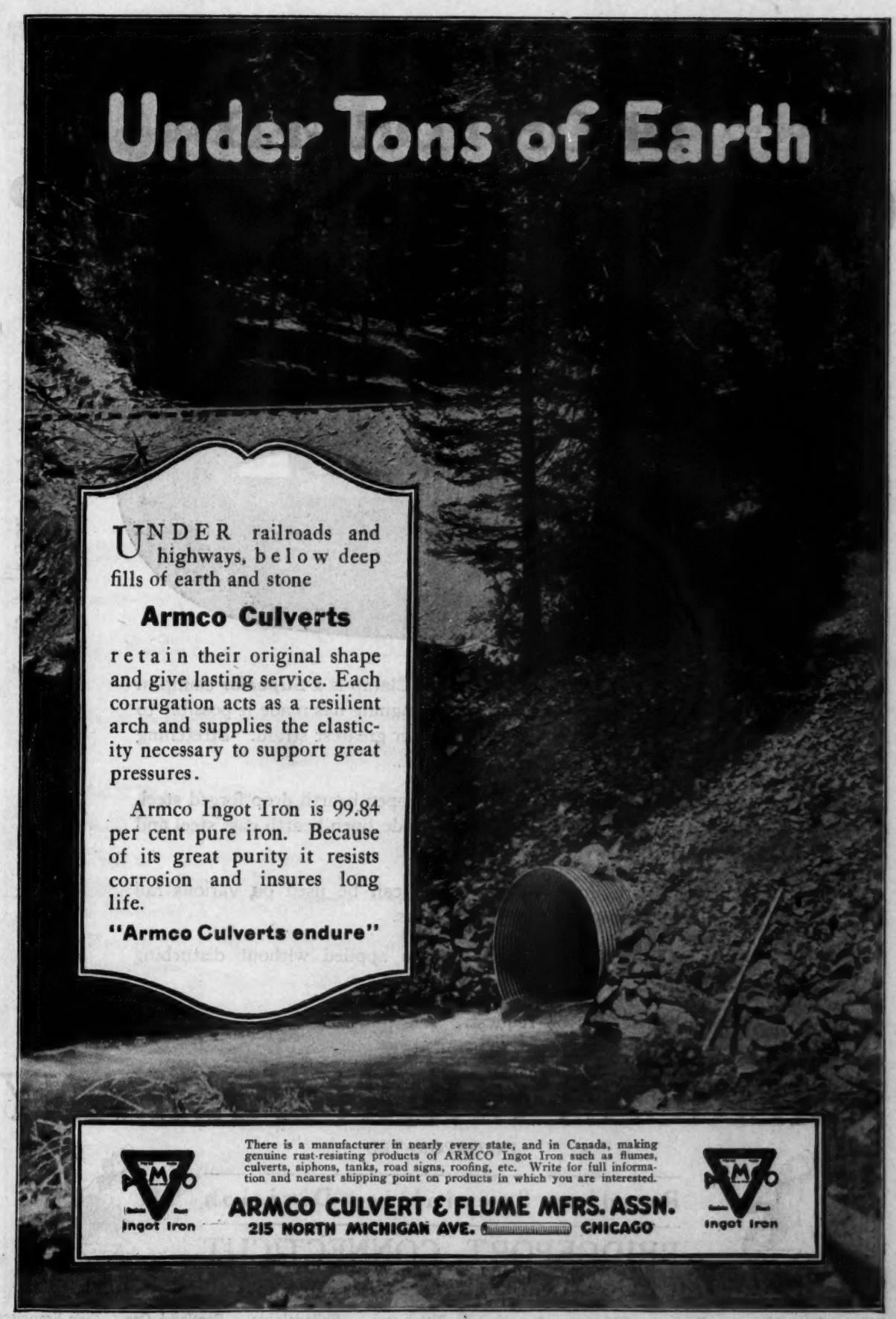
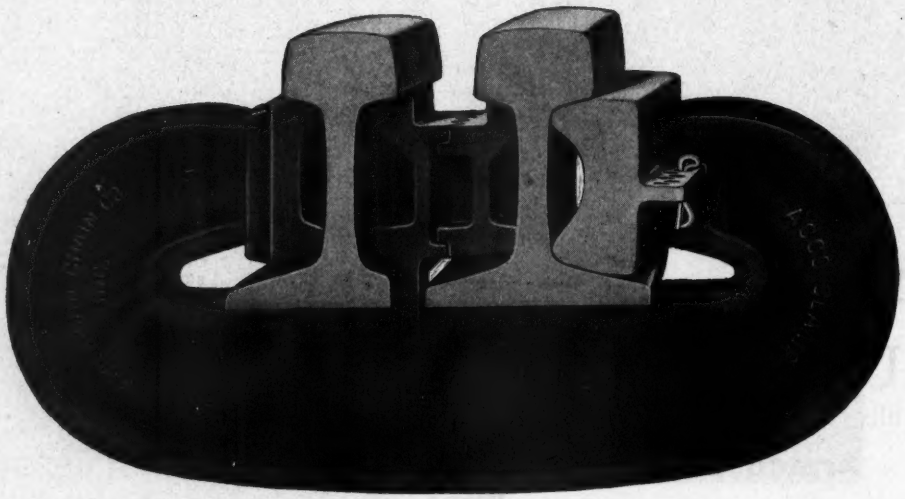

Under Tons of Earth
UNDER railroads and highways, below deep fills of earth and stone
Armco Culverts
retain their original shape and give lasting service. Each corrugation acts as a resilient arch and supplies the elasticity necessary to support great pressures.
Armco Ingot Iron is 99.84 per cent pure iron. Because of its great purity it resists corrosion and insures long life.
"Armco Culverts endure"
There is a manufacturer in nearly every state, and in Canada, making genuine rust-resisting products of ARMCO Ingot Iron such as flumes, culverts, siphons, tanks, road signs, roofing, etc. Write for full information and nearest shipping point on products in which you are interested.
ARMCO CULVERT & FLUME MFRS. ASSN.
215 NORTH MICHIGAN AVE. CHICAGO
Ingot Iron
Ingot Iron

"ACCO"
DROP FORGED
GUARD RAIL CLAMP



The "Acco" Drop Forged Guard Rail Clamp is a ***Superior*** clamp in every sense of the word. Careful designing has made it possible to have the most metal at the points under greatest strain. Stretching and bending have thus been eliminated.

The Yokes are made of best quality open hearth drop forged steel. The Fittings are made of highest grade open hearth cast steel and heat-treated.

The Yokes are interchangeable and can be used on various rail sections by simply using suitable blocks.

"Acco" Guard Rail Clamps can be applied without disturbing guard rail.

Further particulars on request.

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INCORPORATED

Reading Specialties Division

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District Sales Offices: Boston Chicago New York Pittsburgh Philadelphia Portland, Ore. San Francisco

Maintenance of Way Buyers' Guide

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American Saw Mill Machinery Co.

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New Jersey Zinc Co.

RAIL BONDING with THE "IMPERIAL" TAMPER CAR and "LITTLE DAVID" RAIL BONDING DRILLS at a rate of 70 Holes per Hour per Drill

A rail bonding outfit consisting of one compressor car and four bonding drills recently drilled 2094 Holes in 7½ Hours or an average of 70 Holes per hour per drill.

It is estimated that this was ten times as much as could be done by one crew by hand. The number of drill bits used was only about one-fifth that would ordinarily be consumed when drilling by hand. One drill bit had a record of drilling 324 holes before being replaced.

This pneumatic method of rail bonding offers a great saving in time and labor and also in drill bits used—a total saving that soon pays for the cost of the outfit.

"Little David" Rail Bonding Drills can be supplied complete and ready for operation, the outfit consisting, as shown, of the drill in a special type of "old man" with rack and pinion feed. The capacity of these drills is up to 9/16" diameter holes.

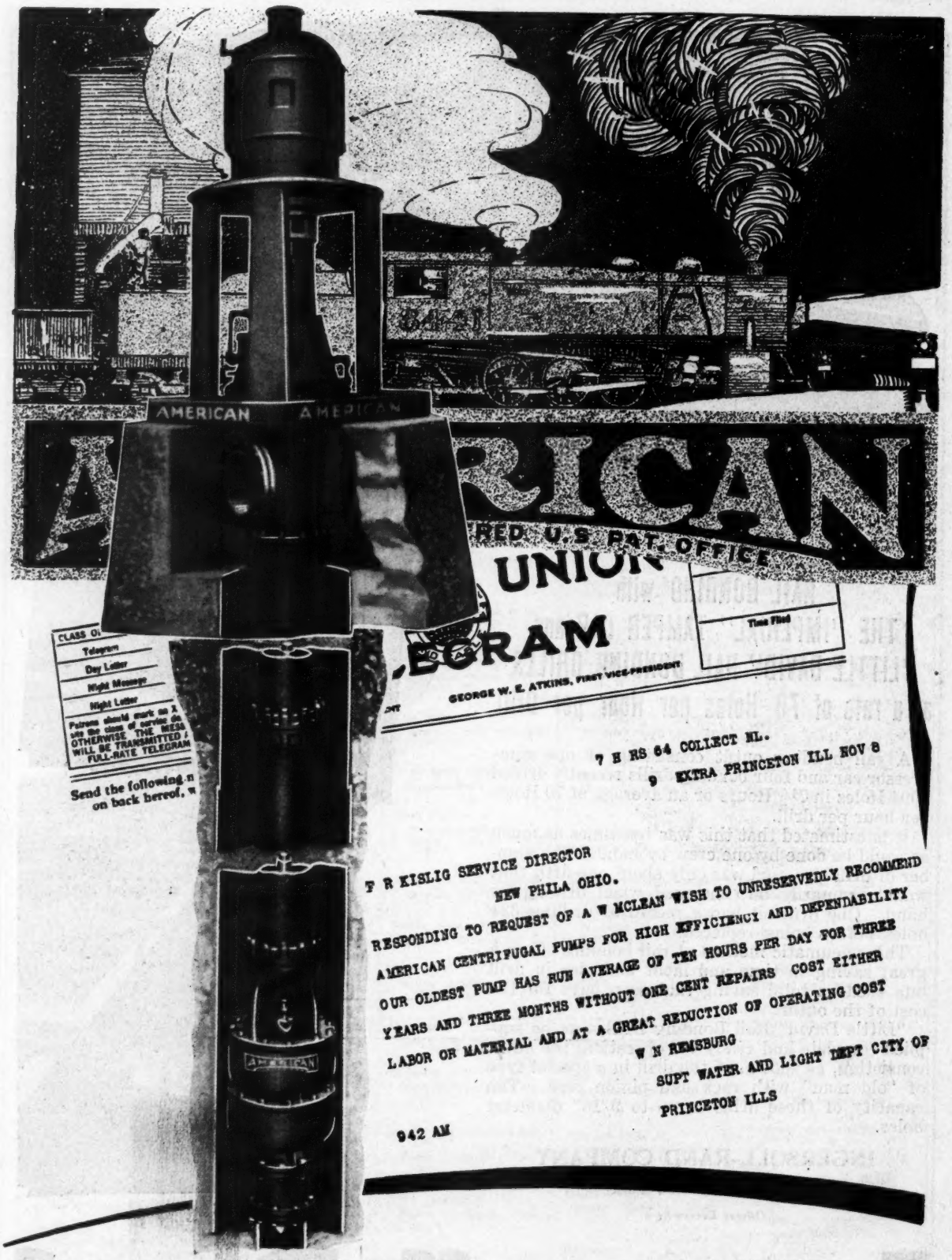
INGERSOLL-RAND COMPANY

11 Broadway, New York

Offices Everywhere

Ingersoll-Rand

155-TT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NEW PHILA OHIO.
RESPONDING TO REQUEST OF A W MCLEAN WISH TO UNRESERVEDLY RECOMMEND
AMERICAN CENTRIFUGAL PUMPS FOR HIGH EFFICIENCY AND DEPENDABILITY
OUR OLDEST PUMP HAS RUN AVERAGE OF TEN HOURS PER DAY FOR THREE
YEARS AND THREE MONTHS WITHOUT ONE CENT REPAIRS COST EITHER
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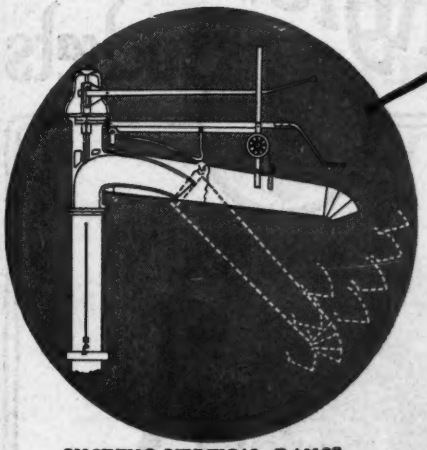
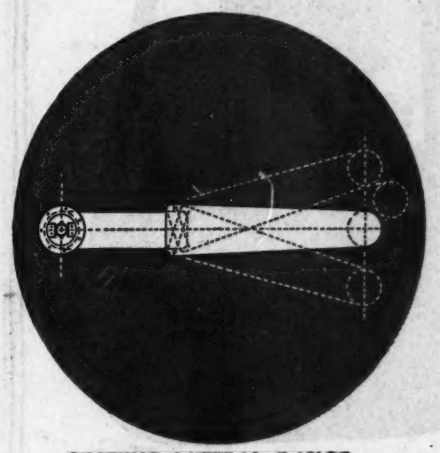


SHOWING VERTICAL RANGE
FENNER DROP SPOUT



SHOWING LATERAL RANGE
FENNER DROP SPOUT

GRAVITY TURNING &
LOCKING DEVICE

Its Quicker-Easier-Safer

to fill your tender tanks with

POAGE *Style* "H" WATER COLUMN

Equipped with

Fenner Drop Spout

Quicker and Easier because the spout can be instantly brought into play without accurately spotting the tender. It works equally well with tenders of different heights. The spout has a vertical range of five feet and a lateral range of three.

The spout is non-freezable. Heavy icicles will not gather upon it. There is no packing at the open telescopic joint, yet, it does not leak a drop of water.

Safer—as soon as it is released the spout swings by gravity to a position parallel with the track and remains there locked. There are no unsafe locking devices to be operated.

The three foot lateral range of the spout prevents the column being tipped over if the tender shifts unexpectedly.

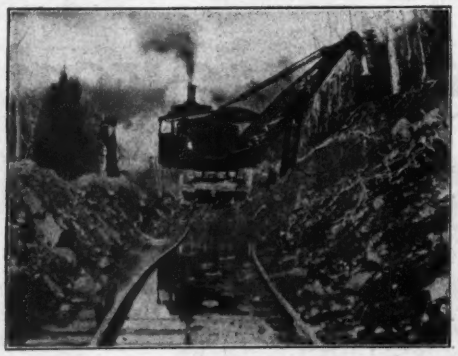
There is no danger of water hammer bursting the mains. The Poage Style H valve shuts off 85 per cent of the flow very quickly and the remaining 15 per cent more slowly—the correct principle to secure quick closure without water hammer.

Try the Poage Style H Water Column—It's better.

MANUFACTURED EXCLUSIVELY BY

The AMERICAN VALVE & METER COMPANY

CINCINNATI, O.



An "Ad" which we did not have to write

Following is part of a letter written by a highly placed railroad official.

"We have one of your machines on the Division on which I am located. The Division is principally in mountain territory with heavy coal traffic. We have a good many slides to contend with during bad weather, much heavy ditching, a good deal of wrecked coal to load, and other maintenance of way work. The American Ditcher is, without question, the most useful machine on the Division. It takes the place of ditching gangs, does all the rail loading and unloading; is equipped with a small clamshell bucket with which we load most of our wrecked coal, and is used for a good deal of service which otherwise would require an expensive wrecking outfit.

"The machine gives excellent service and is subject to practically no interruptions from break-downs. The engineer takes excellent care of it, and, with his machine, is always ready for any emergency. The machine is given a thorough overhauling in our shops, which requires about ten days' time, once a year, and that is practically the only time when it is out of service for repairs."

American Hoist & Derrick Co.
Saint Paul Minnesota

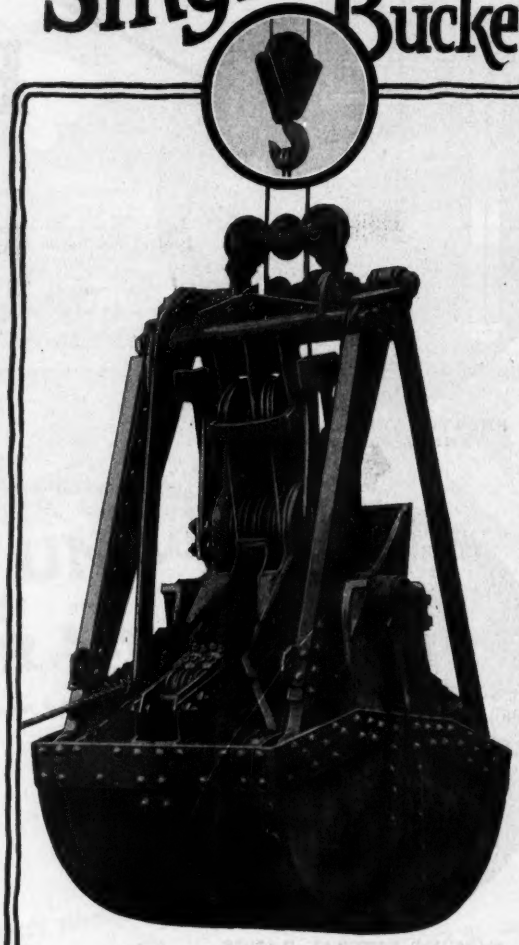
Builders of "AMERICAN"

Hoisting Engines — Locomotive Cranes — Sugar Cane Machinery
Electric Hoists — Railroad Ditchers — Marine Dock Machinery and Tackle
Derricks — Logging Equipment — The Genuine "CROSBY" Wire Rope Clip

New York Chicago Pittsburgh Seattle New Orleans

AMERICAN HOIST & DERRICK CO.

BLAW Single Line Buckets



Your single drum crane or derrick can be clamshell equipped by the installation of a Blaw-Knox Single Line—simply throw the yoke of the closing line over your crane hook and *go* to *work*. No change in the hoisting machinery is required.

Sand, stone, coal, ores, etc.—the SINGLE LINE is a sturdy, substantial, effective clamshell for all kinds of loose bulk material handling.

Made in a number of types and sizes and suitable for all kinds of hoisting equipment and rehandling requirements.

Have a SINGLE LINE Bucket handy—ready to pounce onto any rehandling job

BLAW KNOX COMPANY

PITTSBURGH, PA. 639 Farmers Bank Bldg.

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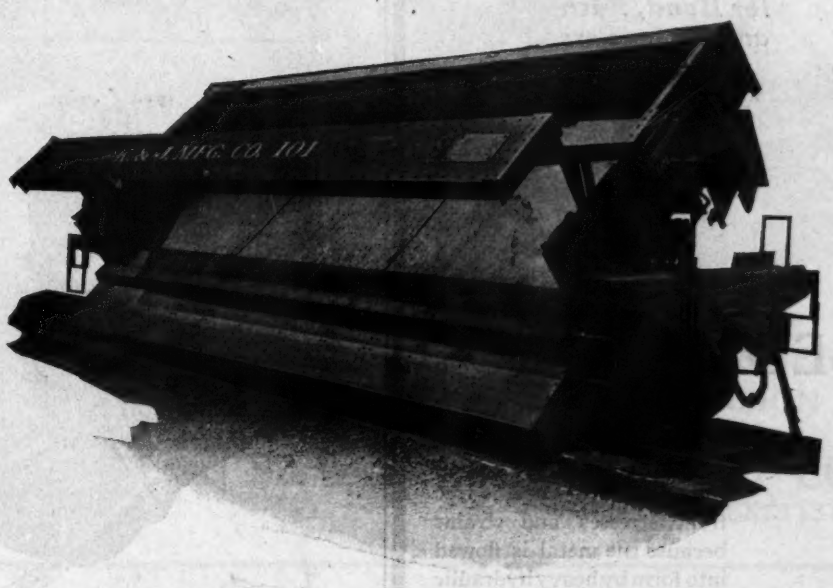

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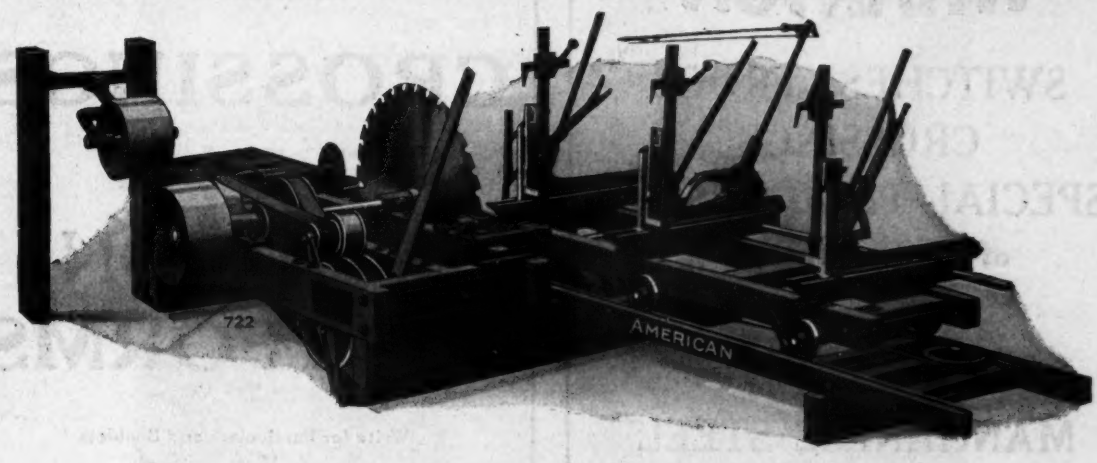

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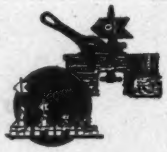

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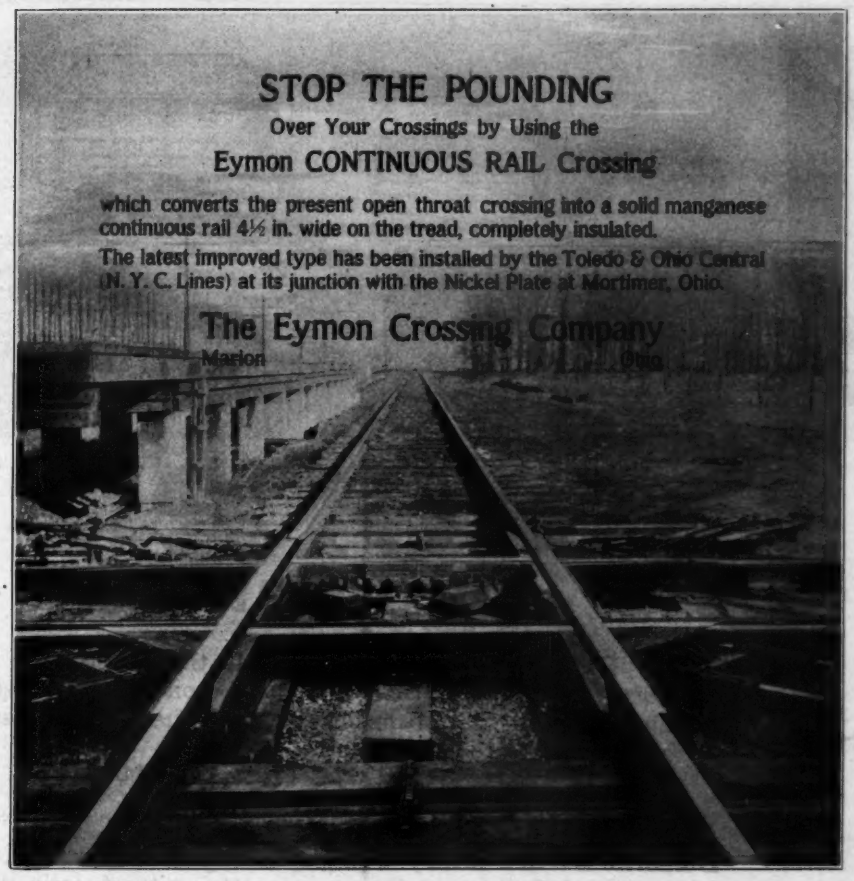
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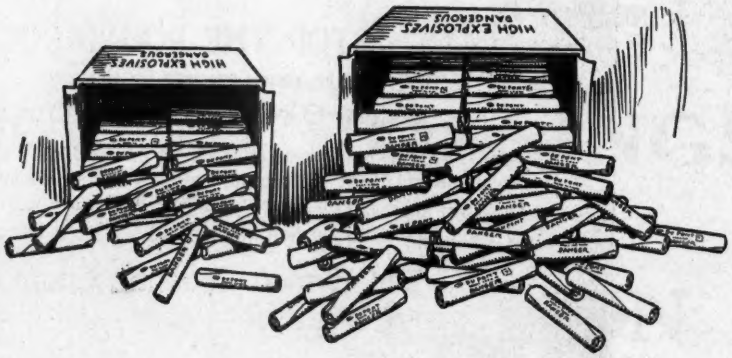

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Railway Maintenance Engineer

Vol. 18 May, 1922 Number 5

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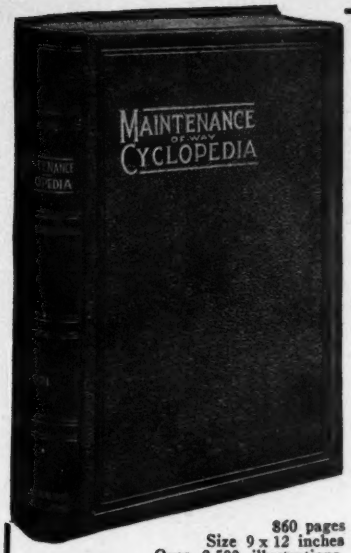

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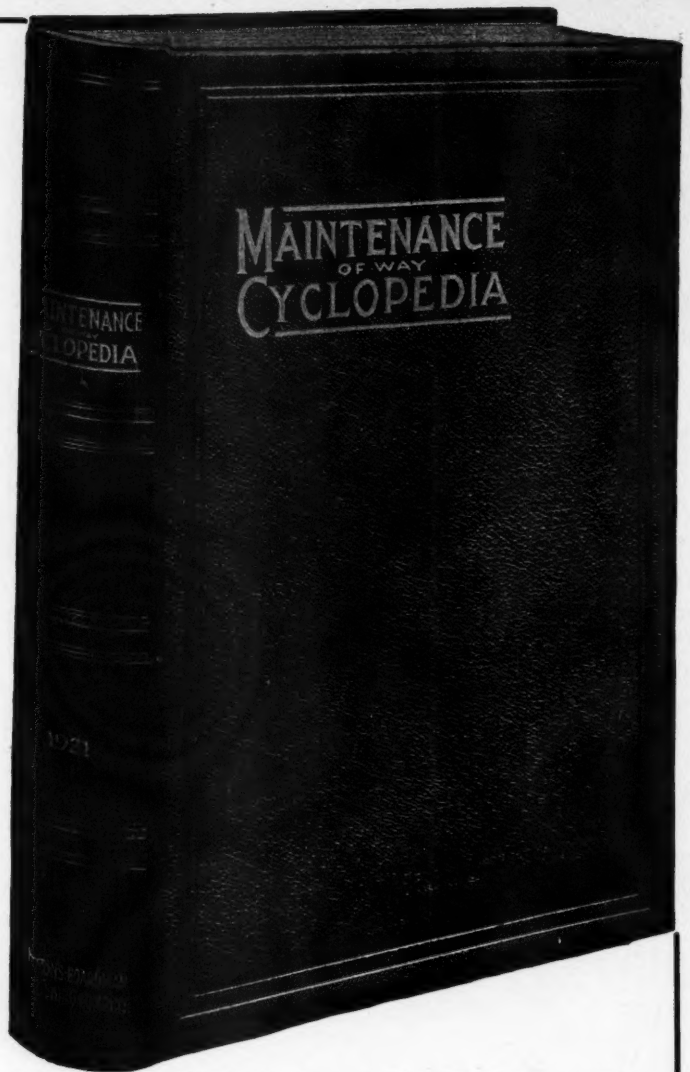

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Railway Maintenance Engineer

Officers and employees of the maintenance of way department are awaiting patiently two important decisions of the Labor Board. One concerns the contracting of maintenance of way work and the other relates to the application of the railways for a reduction in wages. Uncertainty in the minds of those affected by the possible outcome of these pending decisions cannot but militate against the efficiency of the organization. In the case of the contracting, the hearing before the Labor Board was held in December, yet four months have passed and no decision has been forthcoming. With the time for prosecuting maintenance of way work now at hand, it is exceedingly unfortunate that the plans for the work cannot be prepared with a knowledge of the exact status of contracting in its various forms.

Why Continue the Suspense

"You are the bed rock on which the Association rests and the fountain of vitality from which it derives its strength and produces its fruit." In this manner, J. L. Campbell, president of the American Railway Engineering Association, addresses the members of the various technical committees of that organization. The technical associations, such as the various organizations of maintenance of way officers, are judged almost entirely by the character of the committee reports presented at the annual conventions. If the reports lack merit no amount of discussion can compensate for this deficiency (assuming for the moment that an effective discussion could be engendered from a weak and inadequate report). Committee work should be taken seriously as a duty and a responsibility, rather than an honor implying mere purposeless preferment. Any member honored by membership on a committee should see to it that the trust placed in him is not violated.

In Committees There Is Strength or Weakness

More railways are now considering the use of rail weighing more than 100 lb. per yard than ever before. Several roads are ordering it this year for the first time, while others are giving this question serious consideration. The added expenditure for this heavier rail must be justified primarily on the ground of decreased cost of track maintenance and particularly because of increased life of the rail itself. In attempting to investigate the extent to which these advantages are being realized, one is confronted with almost complete lack of data, particularly with reference to the last consideration. Relatively few records are being kept of the amount of traffic passing over rails of various weights prior to their removal from track, but from the limited records available it appears that the heavier sections are giving a life, measured in traffic carried, far in excess of what their relative weights would indicate. Thus, on the Pennsylvania it is estimated that the 130-lb. rail is outlasting the 100-lb. rail 2½ times in its heavy curvature district. It is also estimated that this rail is reducing the cost of maintenance 23 per cent and statistics show that the failures are greatly reduced. Data such as these should be available on every road. It behooves maintenance officers to give this subject more attention for rails constitute too large an item of expenditure for their economical weight to be determined by mere opinion, unsupported by data.

The Justification for Heavy Rail

Few subjects excite greater interest among maintenance of way men than the use of labor saving equipment. However, in so far as actual performance is concerned, there are few subjects on which there has been more talk and less performance. It has been well said that many of the railroads have been too poor to do things economically. However, this is not a full explanation of the reluctance with which the managements are taking up the use of equipment designed to reduce the amount of labor required. There is no question but that an ultra-conservatism (which is now gradually being overcome) has been responsible to a marked degree. The paper by Robert H. Ford, which appears on page 160, constitutes an excellent review of the progress which has been made thus far along this line, but more than this, it comprises a logical analysis of the subject and presents those fundamental principles which must always be taken into account in considering the application of mechanical equipment to any task. A perusal of this paper will demonstrate to the reader that real progress has been made, but a visit to any large manufacturing plant will serve equally well as a lesson on the opportunities which the maintenance of way officer still has before him. There are, of course, definite limitations to the application of mechanical operations to maintenance of way work. In a factory equipped with machinery that can do automatically what would otherwise require the efforts of hundreds of men, it is always necessary to employ a certain number of men to do the odd jobs for which there is apparently no mechanical substitute. So in track work, particularly, there is a certain amount of work which may well be compared with this work in the factory. This miscellaneous work of cleaning up the right of way and the track will probably be done by hand for many years to come, but there is no denying that a very large proportion of the work of keeping up the tracks and the structures of a railroad can be greatly expedited by the use of power equipment. While developments along this line may be slow for some years, they are just as certain to come as was the substitution of the steam shovel for the pick and spade in the building of railroad embankments.

The Future Holds Much in Store

At this season of the year when the roads are entering actively on their major maintenance operations, many of which, such as ballasting, the reconstruction of bridges, and the relaying of rail, interfere with train movements, the problem of the extent to which this interference can be eliminated or reduced is of special importance. On many roads it is the accepted principle that maintenance operations must give way to revenue traffic,

One Way to Reduce Expenses

regardless of the effect on the cost of the work. On others an attempt has been made to so correlate maintenance and operating activities as to reduce the interference of each with the other to a minimum. The result of this latter step is, of course, to reduce greatly the cost of maintenance work. If this can be done without a corresponding increase in transportation costs, the railway, which pays the bills of both departments, obviously profits thereby. The problem is different on single track lines as contrasted with those of two or more tracks. On the former, relief can be secured only by holding back such trains as can be delayed or by bunching them so that the number of interruptions to maintenance operations can be reduced. Much can be accomplished on many lines of this character with the aid of the despatchers in so scheduling extra or dead freight trains that they will pass the point of the work outside of the hours at which the maintenance forces are on duty, etc. On multiple track lines the problem is complicated by the increased number of trains, but it may be simplified by taking one track out of service and diverting trains to the other track or tracks under modified methods of operation. This has been done on a number of roads to excellent advantage. On one western line where rail has been relaid with and without interruption by trains it has been found that each time the track is closed to let a train over results in a loss of 500 to 1,000 ft. of track laid, while the amount of work done under traffic is only half that where the men have uninterrupted use of the tracks. On another road it has been found that ballasting can be done better and at a reduction in cost of 40 per cent where the gang was given the full use of the track for the working day. Surely results of this magnitude are worth working for and they deserve the serious consideration of all maintenance of way men.

ONLY A TRACK SPIKE

A track spike costs only about two cents. It is considered of so little value that it is frequently kicked into the weeds. Yet in 1920 and 1921 one western road purchased over 19 million spikes at a cost of nearly $400,000, or enough to full-spike 2½ miles of track every working day. On this same road over 300,000 spikes are reclaimed annually from the scrap pile, more than half of which are as good as new and thousands of which have never been driven. The presence of so many good spikes in the scrap pile is an evidence of gross carelessness and waste; yet much the same condition will probably be found on every road. If each of the half million maintenance of way employees on the railways of the United States and Canada will save only one spike a day, the saving will aggregate over $3,000,000 annually, or enough to pay for a sufficient quantity of rails to lay 150 miles of track or enough ties to fully tie 600 miles of track.

THE PROBLEM OF THE WORK TRAIN

THE PROBLEM of the work train in maintenance operations is that of reducing its use to the minimum. It cannot be eliminated entirely for it is necessary for certain operations, such as the loading and unloading of rail. However, it can be replaced by a less expensive substitute for many of the duties for which it was formerly considered essential. The cost of the work train itself is variously estimated at from $60 to $100 or more per day. The amount of work which can be done with a train depends very largely upon the attitude and ingenuity of the train crew but the selection of the crew is now so restricted by the working agreements with train service employees that the average efficiency of work train service has been greatly reduced.

This condition makes it of the highest importance that maintenance of way officers scrutinize work train service very carefully to see whether it cannot be replaced by some other transportation agency. Particularly consideration should be given to those trains which are employed continuously, for instances are not unknown where trains put on to meet special conditions for a time, have been allowed to continue after the need has passed, and in some cases supervisors have been hard pressed at times to keep them employed, but have hesitated to release them because of the possibility that they would not be able to secure them again when required.

The increasing use of the locomotive crane, the motor car, etc., have offered the ingenious division engineer and supervisor means of avoiding the use of work trains in many instances. The self-propelled locomotive crane can be used to carry on many operations just as readily as with a train and at a greatly reduced cost. Likewise the motor car is being used more generally for the delivery of ties and other materials to the point of use.

FIRE IN CREOSOTED TRESTLES

ONE subject which has been given prominent attention at intervals during the last 20 years is the fire hazard of structures built of creosoted timber. Creosote oil is highly inflammable, in fact it has such a high heat value as a fuel that it has been used extensively for that purpose in certain metal processes. The consumption of creosote as a fuel during the war was an important factor contributing to the scarcity of that timber preservative. The fire hazard in newly treated wood is well known and special attention is given to the provision for adequate fire protection in all well designed creosoting plants. These facts have been reflected in some quarters by a reluctance to apply creosoted timbers to railway purposes notwithstanding a thorough appreciation of the greatly increased life to be obtained by so doing.

A study of the behavior of treated timbers when subjected to fire indicates that there is a decided difference between the behavior of a timber which has just left the treating plant and that which has been exposed to the atmosphere for a considerable period of time. The period of storage or seasoning permits the more volatile constituents of the oil adjacent to the surface of the timber to evaporate and this greatly reduces the danger of fire. In many cases timbers so seasoned have a flash point that is as high or higher than that of untreated timber. Fire in creosoted timbers which have been subjected to a period of storage have shown a tendency to smother after the lapse of a given period. This frequently has had the effect of leaving the interior of the timber still intact although more or less charred on the outside.

This interesting problem has been subjected to a considerable study, including a canvass of experiences and opinions on the part of railway officers concerned with the construction and maintenance of timber bridge structure, and as a result of this canvass, certain facts have been collected which are summarized in an article on this subject to be found on another page of this issue. This article will be worthy of study by all those concerned with this problem. It is of interest to note in this connection that the Committee on Wood Preserva-

tion of the American Railway Engineering Association has been instructed to study and report on the effect of preservatives on the inflammability of wood. It is to be hoped that the committee will consider this subject from the broad standpoint of its use in structures of the kind commonly built by the railroads, particularly ballasted trestles, for, as shown in the article mentioned above, the character of construction has a marked influence on the degree of inflammability.

THE PROBLEM, OLD YET NEW, OF LAYING RAIL

THIS is an age of machinery in industry, yet only the beginning in railway maintenance work. The laying of rail, for instance, has been considered in the past chiefly a task of manual labor. There are even yet a large number of railroads that still hold this view, but even among these there has been an appreciable change in methods. Traffic conditions, of course, wield a marked influence on the way the work can be done in most cases. Dense traffic is a handicap which bulks large to the man who has seen rail laying carried out under conditions where the track is given over entirely to the maintenance forces for long periods and where complete mechanical equipment can be used. Yet this handicap is often overrated for, to many men, it has proved an incentive which has resulted in better methods and the more intensive use of machinery, thus broadening appreciably what has seemed to others to be a narrow and restricted field of endeavor.

The use of mechanical equipment is justifiable only if it lowers the unit cost as ordinarily figured, if it performs the work better at the same cost or if it does it quicker and equally well at the same or a lesser cost. It must show a gain in some form or other. That its use can lower units costs under all conditions is, perhaps, debatable, although if all of the contributing factors and benefits are considered there will be a satisfactory balance on the proper side in most instances. At least, and this is not at all confined to rail laying, the use of mechanical equipment offers a flexible means of doing work quicker and with less labor,

The increased familiarity of railway men with mechanically-operated bonding drills and wrenches, motor cars, tie tampers and compressors, locomotive cranes, rail loaders and unloaders and other related equipment and devices, has made it possible to pick and choose, to experiment and to develop methods to handle the heavy rail of today and tomorrow that are superior to those of yesterday. On the heavy traffic roads there is a particularly pressing need for the performing of the work quickly, yet economically, the apparent handicap of traffic being, in reality, an imperative demand for more advanced methods, and a challenge to the ability of the men concerned. In this problem, the supervisor stands in a peculiarly important position, for upon him, to a large extent, depends the successful development of the many details which are essential to the success of mechanical methods. It is an old problem but never a more live one than today.

CROSS CROSSINGS CAUTIOUSLY.—The board of directors of the American Railway Association has decided to promote, from June 1 to September 30, a "Careful Crossing Campaign" with a view to impressing on everybody the thought expressed in the title of this paragraph. Uniform colored posters have been designed and will be furnished at cost. The co-operation of the National Automobile Chamber of Commerce, the National Safety Council, and other organizations has been secured.

Letters to the Editor

CHARGING TREATED TIES TO MAINTENANCE EXPENSES

Houston, Tex.

TO THE EDITOR:

I desire to take issue with the conclusion reached by Earl Stimson, chief engineer of maintenance of the Baltimore & Ohio, that the cost of treating ties should be charged to maintenance, as outlined in the paper which he presented before the American Wood Preservers' Association at its annual meeting in Chicago on January 25 and abstracted in your February issue, page 57.

The railway maintenance engineer can no longer limit his horizon in considering the repairs and renewals necessary for the property in his charge, but must include in his consideration the viewpoints of the financier, the executive and the accountant. This requirement has been growing more imperative during the past 10 or 15 years—a period of rapidly increasing railway regulation by governmental bodies, which has been brought to a fitting climax by the passage of the Transportation Act of 1920. Railroads cannot be constructed or operated as institutions for the public benefit only; they must earn a fair return upon their value if they are expected to continue in existence and keep abreast of the development and progress of the territory which they serve.

The primary need of a railroad is to earn money for operating expenses, fixed charges, improvements and, in order that it may prosper and fulfill its obligations to the investors in its securities, sufficient to pay a reasonable rate of return on those securities. The lack of sufficient earning for all of these requirements is first felt by the maintenance departments, and falls heaviest upon the maintenance engineer. Still some of those most vitally interested continue to advocate the charging into operating expenses of amounts representing improvements to their property, and go so far as to argue in favor of the most glaring inconsistency in the present accounting rules—that requiring the charging of the cost of treating ties to maintenance.

It is true that the Classification of Investment in Road and Equipment, Issue of 1914, as prescribed by the Interstate Commerce Commission, does not permit a charge to investment covering the cost of treating a tie used to replace an untreated tie, although it and the Classification of Operating Revenues and Operating Expenses, Issue of 1914, are both noticeably lacking as to specific instructions on this point. Betterments are defined in the classification as improvements of existing facilities through the substitution of steel-tired wheels for cast wheels under equipment, the application of heavier rail in tracks, and the strengthening of bridges by the substitution of heavier members. We are led to infer that the excess cost of metal ties applied in the place of wooden ties over the current price of the wooden ties removed is the only betterment that can be obtained in a tie system. Are we to believe that a treated tie is no better than an untreated tie? If this could be a fact, then why do we use them?

The real facts have proven treated ties superior in overcoming decay to untreated ties. Their use results in economies of operation equally as important and probably even greater than the economies secured from the application of heavier rails, ballasting of tracks, reductions of grades, or the development of terminal facilities. Improvements of the nature just mentioned are made with the intent of reducing operating expenses. The

treatment of ties ordinarily will double their life, and in that way will also reduce operating expenses. Can it be possible that this is not an improvement, or a betterment of the property under a proper definition of the word?

The carriers have, during the past eight years, been undergoing a valuation by the valuation bureau of the Interstate Commerce Commission. This bureau has not valued the untreated tie as highly as the treated tie because it recognizes the difference in worth. Very strenuous objections would have come from the carriers if the bureau had done otherwise. Now the Interstate Commerce Commission is attempting to perpetuate this valuation by its Valuation Order No. 3, Second Revised Issue. But, under this order, a carrier which may have used in renewals one million treated ties, replacing untreated, since its valuation date, at an increased cost over the cost to replace in kind varying from 25 to probably as high as 75 cents per tie, and conservatively averaging 50 cents per tie, or $500,000 total increased cost, cannot capitalize this half-million dollar improvement, but must charge the value of the improvement into its operating accounts. Will such handling perpetuate the valuation work now almost completed? Is it not unfair when this carrier is deprived of its increased value, to give another carrier, constructed new in the past two or three years with, say one million treated ties in track, the privilege of capitalizing the full cost of those ties and earning a higher net operating income based on this higher capitalization?

Under the Transportation Act of 1920 the Commission has placed a value upon the carriers by groups and fixed rates designed to earn a fair return upon such value in the aggregate. Two years have passed and at no time have the rates been sufficient to allow even a fair-sized minority of the carriers to earn this promised return upon their value. But, assuming that conditions had been normal during this period, and that the carriers as a whole had earned the maximum allowable return, then this return would have been short by the amount they should have earned on the increased value of their tie systems, resulting from the betterment growing out of the practice of using treated ties in larger numbers each year. and likewise the operating expenses would have been and actually were, greater than they properly should have been, to the extent that they included the increased values of the improved tie systems.

Should not the Commission amend the present accounting rules as affecting treated ties? By so doing it would not only allow the carriers to earn a larger net operating income, but would materially decrease the operating expenses of the carrier, which decrease would finally reflect itself in lowered rates. It has been suggested that it would not be practical to keep accurate account of treated ties. This can be done very simply by the use of a marker so that treated and untreated ties can be identified and classified when retired.

It is quite true that there are varying kinds of treatment, both as to cost and effectiveness. But this cannot be used as an argument against charging the increased cost due to treatment to capital account. The cost of the same kind and size of untreated ties varies in different portions of the country. The valuation bureau did not argue that a flat price should be used for each size and kind of tie regardless of the local conditions entering into its cost. Neither can the increasing ratio of the cost of the timber to the cost of treatment have any bearing upon the principle involved. The treated tie will always cost more than the untreated, and the excess cost due to treatment will always be an appreciable amount.

The more general treatment of hardwood, as well as softwood ties, is being advocated strongly, and it will not be many years until practically all ties will have to be treated as an economic necessity. It has been the urge of this necessity which has caused carriers in the past to attempt, through treatment, to increase the tie life, from 75 to 100 per cent, regardless of how the cost was accounted for. But, can they be expected to continue this practice with the accounting classification throwing the expense into operating accounts and the Transportation Act limiting their income? Railroad earnings are now low and have been for so long a time that the carriers have almost forgotten the meaning of prosperity, although the rates are now generally higher than at any time prior to 1920, or than they probably ever will be in the future. Then what better method of providing for the increased expense due to treatment of ties can be found than by capitalizing this increased cost?

The writer is an unqualified advocate of the use of treated ties and would regret being interpreted otherwise. But it is not merely desirable, but very essential to the continued use of treated ties in annually increasing quantities, that the excess cost be properly accounted for as a betterment, and that inconsistencies in the Classification of Investment in Road and Equipment be removed. The maintenance engineer cannot keep every dollar of the carrier's earnings for maintenance uses only, but must share them with other interests who, by virtue of their investment, have a right to a share. He must plan his expenditures in such a way as to make the earnings of each succeeding dollar just a little bit easier than the one before, and in so doing he will not be paying tribute to capitalization, but will merely be fulfilling his trust.

F. S. SCHWINN,
Chief Engineer, International & Great Northern.

NEW BOOKS

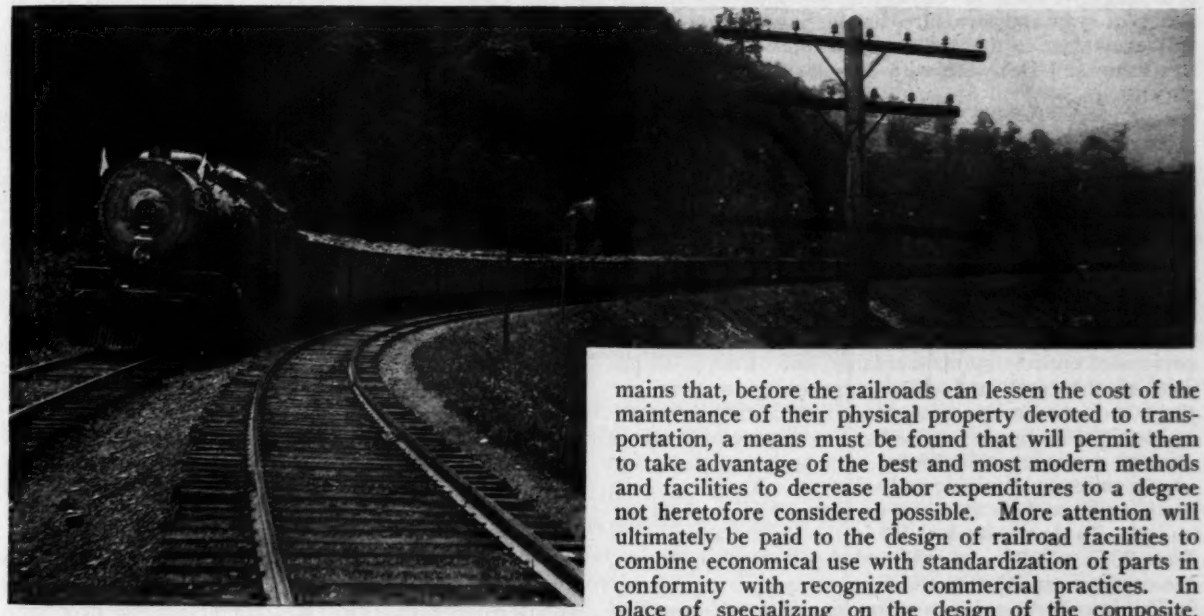
Modern Tunneling, by Brunton & Davis. Second edition with new chapters on railroad tunneling by J. Vipond Davies, 6½ in. by 9 in., 612 pages. Illustrated. Bound in cloth. Published by John Wiley & Sons, New York City.

The first edition of this book, published in 1914, was confined primarily to water and mining tunnels of smaller section than those used in railway work, whereas the new edition contains 200 additional pages devoted to the railroad or larger bore tunnel. The first 400 pages apparently have not been revised, since all data and references antedate the previous date of publication. The various factors entering into tunnel work, such as machinery, ventilation, drilling, timbering, blasting, etc., are covered in separate chapters, while the 200 pages on railroad tunneling are subdivided into chapters dealing with the general subject, and construction, followed by chapters relating to the building of tunnels through different classes of materials, such as hard rock, loose rock, and softer materials with a rather extended treatment of subaqueous tunnels. Another noteworthy feature of the book is the large amount of space given to bibliography, this amounting to 60 pages in the older portion and 9 pages in the new. With the exception of the Mount Royal and Rogers Pass tunnels, the principal references made to particular railroad construction projects relate to the large tunnels built in the vicinity of New York City. The text goes into considerable detail concerning the construction of concrete linings, including reference to the pneumatic process for mixing and placing concrete. However, the relining of tunnels, which has become a matter of increasing importance, is given but minor attention.

Field for Labor Saving Devices Large*

Maintenance of Way Operations Offer Many Opportunities for Use of Mechanical Equipment

By Robert H. Ford
Assistant Chief Engineer, Chicago, Rock Island & Pacific, Chicago



CONDITIONS on American railroads are such that they must depend upon the seasonal or extra-worker for the greater part of their annual maintenance program, hiring on short notice, largely through labor agents, and discharging in the same manner. These men of necessity have little adaptation for the work in hand. The result must necessarily be that vast sums of money are paid for numbers of inefficient workers who cannot give a fair return for the compensation received. Every employee added to the railroad pay-roll represents an average capital investment of about $10,000, which is doubled and trebled in proportion to his inability to render a normal return on the investment.

Time studies of seasonal or extra-gang laborers engaged in similar classes of work, made some years ago on various railroads, showed that their productivity ranged from 28 to 33 per cent. Although the regular section organization runs higher than this, the fact remains that on most railroads the productivity of maintenance labor has not been commensurate with that secured in other industries where other means have been used and some measure employed for gaging output. With the permanent section force, consisting usually of a foreman and one or possibly two men, such conditions will not be found, as a general rule, but the effect of years of low rates of pay for this class of really skillful labor has been to lower the standard and drive much desirable material to other lines of industrial activity, a condition which became pronounced in the years just preceding the war.

While a great deal must yet be done in the selection, training and education of labor generally, the fact remains that, before the railroads can lessen the cost of the maintenance of their physical property devoted to transportation, a means must be found that will permit them to take advantage of the best and most modern methods and facilities to decrease labor expenditures to a degree not heretofore considered possible. More attention will ultimately be paid to the design of railroad facilities to combine economical use with standardization of parts in conformity with recognized commercial practices. In place of specializing on the design of the composite, effort must be in the direction of interchangeability of parts as far as possible in order that they may be adapted to varied types and classes of facilities rather than to special classes as at present. This fact, of itself, will not only permit great reduction in maintenance costs but will also in turn effect the design and adaptability of labor-saving devices used in their up-keep. For example, locomotive cranes, motor cars and work equipment of all kinds should be so designed that their parts will be interchangeable with each other and with locomotive or car parts wherever possible and in conformity with M. C. B. standard rules. Wherever practical, details in coal chutes, water cranes and various forms of mechanical appliances should be similarly designed and more attention paid to widening the range of interchangeability and economy for maintenance and renewals.

Specialization in railroad maintenance has lagged behind nearly all other lines of industry. This is not due to a failure on the part of the railroads to appreciate the importance of such matters but because of the fact that for years the roads have been too poor to be economical, a fact that will as a rule be reflected in more or less expensive methods of up-keep, whether on a railroad, in a factory, or on a farm. The inability to keep pace with science and invention in providing proper appliances to replace obsolete methods and facilities prevails to a marked extent on our American railroads. Working conditions, legislation and higher costs of labor have served to accentuate this of late and as a result changes in methods of up-keep are sure to result. As evidence of this, more attention has been paid and more actual advance has been made in this direction in the last few years than in the previous 20 years and, from every economical and industrial standpoint, this development is bound to continue at an accelerated rate.

Last year about 460,000 men were required to main-

*Abstract of a paper presented before the Western Society of Engineers, at Chicago, on April 20, 1922.

tain the roadways of the United States. This is equivalent to over 16 army divisions and, if marched in army formation, in columns of fours, it would extend for 208 miles and require nearly nine 8-hour days to pass a given point. Approximately 360,000 of these men performed work that some day will be done either wholly or in part by mechanical means. The employees required in 1920 to maintain the American railroads were equivalent to the entire population of North and South Dakota, while those engaged solely in roadway maintenance (or maintenance of way and structure, as this is usually termed) was equivalent to the entire population of the states of Wyoming and Delaware with Nevada thrown in.

Enormous Expenditure for Labor

To maintain the railroads of the country, vast amounts of labor and material are consumed annually for which there is little or nothing to show at the end of the year. Three hundred and fifty-four million dollars or about 54 per cent of the maintenance outlay was for roadway and track repairs, requiring a vast army of men. The roadway must be continually drained and ditched, approximately $31,000,000 being annually expended for these purposes alone. In former years this class of work was performed entirely by manual labor, one of the principal jobs of the track and extra-gangs being to clear out the side ditches in cuts or slopes, either casting the material back, if no means was at hand to dispose of it otherwise, or removing it by means of a push or flat car for placement upon adjoining embankments. Years ago such work could be done at a cost of from 10 to 25 cents per cu. yd. To do the work today in the same manner costs from $0.75 to $2 per cu. yd., and if performed by teams, the cost is from $0.50 to $1.75 per cu. yd.

The introduction a few years ago of a self-propelled steam ditcher consisting of a small steam shovel weighing about 14 tons and working from a flat car afforded great opportunities for labor reductions in this direction. One of these machines will perform the work of from 75 to 100 men and reduces the cost enormously. The push and flat cars have given way to automatic air dump cars with a steam ditcher between them, the machine working from the track and loading and moving the material by a self-propelled device to the point of disposition. These steam-ditching machines can also be put to a variety of other uses, such as handling coal and loading and unloading various classes of material; their daily use as a labor saver, when not engaged in ditching, depends largely upon the ingenuity and organization controlling their work.

A comparatively recent innovation in the list of ditching equipment is the ditcher-spreader, consisting of a steel car, equipped with wings similar to ordinary spreaders (for which purpose it is also used) but with the addition of a detachable cutting edge so shaped as to form the standard ballast section. This machine not only clears the ditches but it also shapes the sub-grade from the toe of the ballast to the shoulder of the roadbed and cuts and cleans the side ditches beyond the roadbed in one operation, leaving a uniform and highly satisfactory appearance. The ditcher-spreader is pushed by a locomotive and will ditch complete from 10 to 25 miles of track per day, completing both sides of the roadbed where necessary. It does the work of several hundred men at a cost of from 2 to 6 cents a cu. yd. This machine will dig new ditches, but its main advantage is to keep the sides clear of the annual accumulations while the steam ditcher, previously referred to, is most economical in long, heavy or sliding cuts. The steam ditcher costs about $10,000 and the ditcher-spreader from $15,000 to $20,000, depending upon the size of machine.

In certain sections of the country right of way ditching is necessary near the fence lines. As a rule these ditches are deeper and larger than are required along the roadway and construction by manual labor is an expensive operation. A ditcher-tractor offers many attractive possibilities in reducing labor requirements, combining as it will many other items of up-keep for work that cannot be reached directly by machines operated from the track.

The strengthening of railroad embankments is also an operation which is more or less continuous because of the effect of the elements on the material supporting the roadbed. For years it was customary to use flat cars with a work train, on which the material was loaded by hand or steam shovels and hauled out to the place of use, to be unloaded by means of unloading plows attached to the rear end of the train and drawn through the material by a Lidgerwood unloading machine. Changing conditions, greatly accelerated by the introduction of new rules and working conditions affecting all departments of the railroad, have made this method so expensive and cumbersome that it has now no place in economical maintenance. The automatic air dump car, operated direct from the locomotive and loaded by the locomotive crane, steam shovel or other appliance, replaces the Lidgerwood plow, flat cars, bunk cars and other accessories and, in the hands of a skillful operator, can be made to unload at will with the train in continuous motion. The latest type is arranged with an apron extension so that the material can be dumped clear of the ballast and then followed up, where necessary, by a modern steel spreader which permits the whole operation from the initial loading to the final placing to be done with very little labor and expense as compared with the large gangs of laborers heretofore necessary. These air dump cars cost approximately $3,200 and there are several excellent types on the market today.

Although the hand car is an obsolete and expensive factor in railway maintenance, it still continues to be used on a very large part of the railway mileage. The section motor car replaces this and has now become an essential for track maintenance, both as a means of economizing labor and reducing expenditures. A section motor car costs about $275, with an annual maintenance of about $25, exclusive of fuel. Besides the saving in time in moving back and forth and the ability to cover a larger territory than by a hand car, it leaves the men fresh start on their job.

Laying Rail

It has been customary for many years for all operations incident to replacing rail to be done by manual labor. The time was when the average weight of a rail was from 500 to 600 lb. but this has now increased to from 1,100 to 1,500 lb. Almost every railroad man can recall the days when from 15 to 16 men were required in unloading rail, preliminary to placing ready for renewal, and from 100 to 200 men were engaged in laying it. In later years the tendency has been to decrease the size of these gangs but, measured in output, the results generally have not varied to any great extent. It is now entirely practical to do the greater part of this work by mechanical means, from the unloading to the final stage of the operation, until the released rail and fastenings are placed in cars ready for shipment. Pneumatic air machines for unloading, operated by 2 or 3 men in place of the 15 formerly required, gasolene or electric driven locomotive cranes or small hand power machines operated by 3 or 4 men will do the work that formerly required 5 to 10 times that number in laying rail.

Many of these machines are provided with a trailer

to transport the men to and from the work. They have a capacity of about 30 men and are operated in conjunction with the rail laying machines. These trailers can also be used for a variety of labor-saving purposes in connection with rail laying, their use and cost depending upon the amount and character of the traffic and other operating conditions.

Power driven pneumatic drill, power bonding machines and power track wrenches are some of the labor-saving devices that operate to reduce the cost of this work and will permit increased efficiency and be productive of great economy in rail renewals. The labor cost of laying rail varies from $700 to $2,000 per mile, the large fluctuation being influenced largely by operating conditions and facilities. A fair cost today is probably about $1,400 a mile. To my mind, the time is not far distant when it will be practical to do this work for about one-third this sum. Twenty million dollars were expended last year for labor in the performance of this work. There are unmistakable evidences today that ultimately this work can be done almost entirely by mechanical means.

A pneumatic air machine, mounted or built on a flat car and equipped with two air derricks, one at either end and placed between two flat cars, will load the equivalent of two miles of roal at about one-tenth of the cost by former methods. A derrick truck consisting of a small derrick car is now available for use in large terminals or moving rogs, rails, switch material and heavy timbers. It consists of a turntable truck, looks very much like a miniature crane and can be lifted from the track by three men. It will do the work formerly requiring two or three times that number. Its advantages pretty yargely depend upon the versalility of the foreman.

Last year about 460,000 men were required to maintain the roadways of the United States. This is equivalent to over 16 army divisions which, if marched in army formation, in columns of fours, would extend for 208 miles and require nearly nine 8-hour days to pass a given point. Approximately 360,000 of these men performed work that, some day, will be done either wholly or in part by mechanical means.

I do not believe that the average railroad man appreciates the widespread usage and great opportunity for savings from a properly designed locomotive crane. These machines will do about everything required in lifting, placing, transferring, pile driving, erecting, digging and, in fact, anything of this class where manual labor has been necessary heretofore. The range of their use is entirely a matter of education. Not only are they extremely valuable in maintenance of way work, but they are adaptable for wrecking, loading coal, cleaning out cinder pits, moving mechanical material and appliances, in and around stores department and numberless other uses. Their activities are predicated very largely upon the organization and method of control. If these machines are equipped with generators and electric magnets they can be utilized to a great advantage in the larger terminals in picking up scrap and transferring and loading heavy material.

Oiling Track

One of the expensive items of roadway maintenance is caused from the deteriorating effect of brine drippings and salt air in the vicinity of the ocean on rail fastenings, spikes, bolts, tie plates and even in some cases on the rail itself. This requires that these metal parts shall be oiled periodically and the work is usually done by track labor. An oiling machine, introduced on the Delaware, Lackawanna & Western by A. J. Neafie of that company, has proven invaluable, both as a means of performing the work efficiently and decreasing labor costs. The cost of oiling joints only by a mechanical oiler runs from $3.50 to $7 per mile (depending largely on the cost of the oil), being much less than it costs by manual labor, but when the other track appliances are included the difference is so great that much of this work becomes impractical for hand labor.

Track Weeds

The American railroads spend today about $30,000,000 for clearing the weeds from their track, with about $16,000,000 additional to keep the right of way clear of brush and weeds. It is customary on a majority of the roads to do much of this work by team mowers, or by hand using a common scythe. Due largely to the fact that there is so much broken or rough and rocky land within the right of way, no machine has been developed for this purpose, but the tractor is well adapted for the greater portion of such work. A great opportunity for savings in this single item is represented by the development of the tractor and sickle-bar, both of which are now in use to a limited extent.

Track weeds give rise to one of the larger items of roadway maintenance. On important lines it is necessary that they be removed from the track in order that it may be properly maintained. It forms one of the principal jobs of section labor and requires the services of an average of over 100,000 men for five months of the year to clear the American railroad tracks of weeds. A weed burner, operated twice during the season, will remove the weeds at a cost of $14 per mile per trip, as compared with $135 per per mile for hand labor. This is only one of several devices that is entirely practical for the purpose.

On branch lines the ballast shoulders can be taken care of by the disc weed cutter, which operates at a cost of about $4.50 per mile as compared with $25 per mile for hand labor. Track mowing machines which consist of a sickle bar attached to a heavy duty motor car and so adjusted will cut the weeds six feet from the rail, starting from the outer edge of the ballast section. This can also be adjusted to a hand car and operated by hand. These machines operate at a speed of from four to six miles per hour, at a cost of $5.50 per mile, as compared with $40 per mile for both sides of the track by hand labor.

Destruction of weeds by chemicals is both possible and practical, although the field is yet open for further development. Here again much remains for the inventive genius. The foundation for most chemical weed destroyers is arsenic in a soda solution. It is sprayed on the roadbed from specially constructed cars passing over the line at a speed of about 20 miles per hour. From one to three applications are necessary during the growing season, depending on the class of weeds and the frequency of use. After a series of applications the interval between applications can be increased and the cost correspondingly reduced. It is possible by annual applications for a few years to sterilize the soil so that weeds will not grow. There has long been an aversion to the use of chemicals for weed destruction on account of danger to live stock and the claims resulting therefrom, but changing methods have made it practical to

use chemicals which destroy the root as well as the stem, differing in this respect from the weed burners which destroy the part only above ground. In my judgment the time is not far distant when a great part of the money now spent annually for weeding on the railroads will be no longer expended because chemical and mechanical means will render this labor cost unnecessary.

The trackman does the lining and surfacing of the track, tamping up the ties and correcting the alinement by means of shovels, tamping bars, tamping picks and similar tools. The surfacing work especially is of necessity performed in a slow laborious manner, spotting up the track as it is called or surfacing out of face. In the former case, the loose places between the ties and ballast are located and the ties brought up to a uniform bearing under the rail. Long stretches are corrected in the same manner except that all ties in the section are brought to a firm bearing and uniform surface, the extent of the work varying with the standard of maintenance required, largely dependent upon the speed, frequency and weight of passing trains. Approximately 44 million dollars is annually expended for this work, which is almost exclusively a labor item and is performed by the section and extra gang forces.

There are now upon the market tie tamping machines, operated both electrically and by means of compressed air, in some cases the section motor being used to run the compressor. These machines cost about $2,500 each, and reduce the cost of the work greatly. As a general rule these machines are better adapted for rock and other heavy ballast than for light material and for this reason there is considerable room for further development in this direction. The tie-tamping machine is a practical, efficient tool. Its use, however, has not become as general as the circumstances warrant, doubtless because of the initial investment. One important trunk line is using a pipe line over a hundred miles long which parallels its track for an air line to furnish compressed air for tools of this and like character, with a corresponding reduction in the cost of maintenance throughout this territory.

Ballast becomes foul by use and must be either shoveled out by hand and wasted on the adjoining slopes or cleaned by screening. It is customary for many roads to do the latter work by hand, using the old fashioned screen (somewhat similar to a coal screen). Even at that they are enabled to show savings, principally because of the first cost of the ballast. While there is yet a great opportunity for an inventive genius to reduce costs of this nature there is now on the market a power operated mechanical ballast screen that greatly decreases this cost over hand labor and conserves the ballast supply, a matter of special importance in certain localities.

Picking up scrap and cleaning the railroad right of way and yards fall to the maintenance laborer. There are many short cuts where savings can be made by local appliances that help out wonderfully in reducing the cost and equivalent labor required. As stated previously, a tractor or locomotive crane equipped with a magnet offers great opportunities in this direction, especially when combined with the facilities for cleaning, collecting or piling miscellaneous material. There are also many opportunities for the reduction of labor costs in this direction, particularly in bridge and water service work.

For many years, I have made it a rule whenever possible to see inventors and those having constructive ideas for labor-saving devices and it is from this experience that I venture to call attention to some fundamental considerations. As a general rule, a man unfamiliar with railroad operation or maintenance does not appreciate the conservativeness that is necessary on railways because of the necessity for safety to life and property and the hazard that is involved in everything connected with railroad operation. Simplicity is also an absolute essential. One of the essential features is a well grounded knowledge of costs under existing conditions, the experience of others on proposed remedies and their reasons for failure if any, together with a willingness for research and investigation, matched only by the usual amount of patience and perseverance, which the inventor usually has with a knowledge of the proper cost of manufacture of the proposed devices. Is it conservatively safe, cheap, simple and essential? These are the main questions.

Spring Floods Damage Middle Western Roads

A PROTRACTED period of rainfall during the early part of April was the cause of high water in middle western states, particularly in the Upper Mississippi and the Ohio river valleys. The greatest damage to railroads has resulted from exceptionally high water in the Illinois river, the stage for almost the entire length of this stream being higher than for a great many years previous. The greatest destruction was in the vicinity of Beardstown, Ill., where the Chicago, Burlington & Quincy lost about four miles of railroad embankment,

International, Chicago

A Break in the Levee Washed Out Burlington Tracks Near Beardstown, Ill.

thus cutting off the Burlington's through coal route from southern Illinois to the northwest.

South of Beardstown, about twenty miles, a washout on the Wabash cut off service on the Keokuk (Iowa) branch. Considerable destruction also occurred in the vicinity of Peoria, Ill., where a portion of the local railway terminals were flooded, while the line of the Chicago, Rock Island & Pacific into Peoria from the north was interrupted for a short time by a washout at Mossville. High water in the Mississippi river caused washouts on the Davenport, Rock Island & Northwestern, which cut off rail communication between Davenport, Iowa, and Clinton. The Chicago & North Western, and other roads in the vicinity of Fond du Lac, Wis., Oshkosh and other points on Lake Winnebago suffered from high water in that lake.

Are You Dissatified With Your Chances for Advancement?

President Storey of the Sante Fe Was in This Same Frame of Mind When He Entered Railway Service

By WALTER S. LACHER

"MANY YOUNG MEN are inclined to look with disfavor on railway engineering," said William B. Storey, president of the Atchison, Topeka & Santa Fe, in discussing the opportunities of railway employment. "It may seem rather odd, but that is exactly the way I felt about it myself 45 years ago. During one high school vacation and for 14 months after graduation I worked as a stakeman, chainman and rodman on the Berkeley branch of the Central Pacific, now the Southern Pacific, with the intention of taking up civil engineering at the University of California, but by the time I was ready to quit my job and go to school I had become thoroughly convinced that the compensation for engineers in railway service was so meager that railway engineering offered a very unfavorable field for advancement. Accordingly, I changed my plans and took up mechanical engineering."

"Did you maintain this impression throughout the course of your school work?" he was asked.

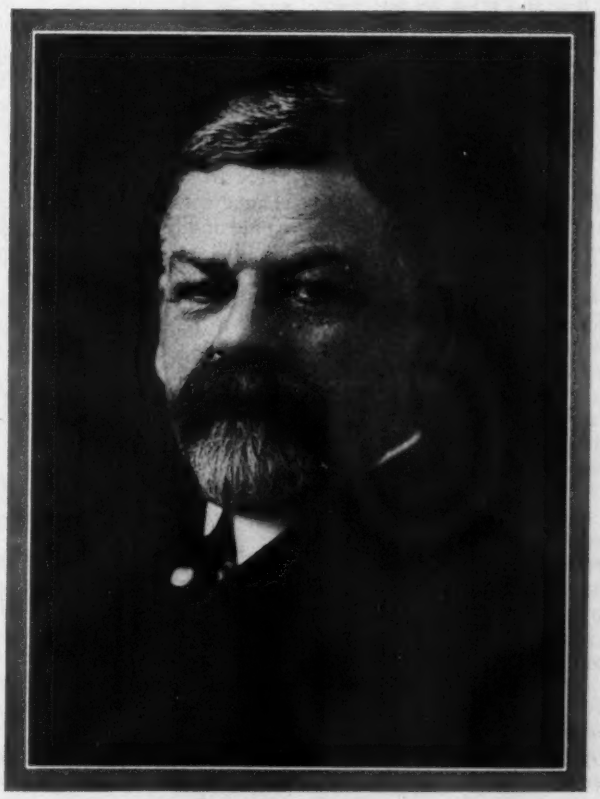
"Yes, I was of the same opinion in 1881, just before graduation, when I was given an opportunity to go back with the Central Pacific as a rodman, providing I would leave without waiting for commencement. I did not care to go into this work again, but as I needed the money and had completed my studies, I decided to take the position purely as a temporary makeshift with the idea of changing to some other line as soon as I had the opportunity. But, as you see, I am still at it."

"You were in college only three years, I understand?" he was asked.

"Yes. When I entered I had only enough money to take me through two years, but before the end of the second year I found that I could complete the work in another year and was fortunate in securing funds that would enable me to do this."

"Your three-year course in college is in striking contrast with the tendencies now when the engineering schools are proposing six-year courses. Do you not think six years is rather long, especially as executives seem unanimous in insisting that college men cannot attain success in railway work without thorough training in subordinate positions after finishing their college work?"

Mr. Storey's reply was emphatic. "If you aspire to be an engineering officer of a railroad, you must have a fundamental knowledge of your profession, whatever time it takes to get it, whether it be four, five, six or seven years. If, on the other hand, you wish to develop as an executive or manager, it is essential that you have a faculty for organizing, systematizing and getting work done, for putting the right man in the right place, for telling men what you want them to do and for being sure that it will be done. Ability to do these things is not obtained from books, and I do not believe that a man's success as an executive would be influenced one way or another by the number of years he spends in college. We have had in our organization a number of men of extremely limited education who were advanced to important positions because of their native ability to direct others and who were, withal, exceptionally broad-minded. Wide experience is of course valuable in developing the executive, but back of it all is that intangible quality which enables one to direct an organization, to measure the men for the positions, to see that the square men are placed in the square holes and the round men in the round ones."



William B. Storey
President, Atchison, Topeka & Santa Fe.

Some young men are inclined to the opinion that railroad employment is too uncertain, that it entails too frequent demotions and periods of idleness with fluctuations in railway earnings. There is also the feeling that times were better on the roads in the days when the executives of today were at the foot of the ladder. But when this thought was put to Mr. Storey he said that railroad employment back in the eighties and nineties was by no means without its depressions.

"My position with the Central Pacific in 1881," he continued, "was that of rodman on reconnaissance. In 1882 I was promoted to instrumentman and levelman and in 1883 and 1884 I was employed as assistant engineer on some very heavy mountain work in the Sacramento canyon, but in the latter year a financial depression re-

sulted in my losing my position. I then formed a partnership with a friend to engage in private engineering practice and eked out an exceedingly precarious existence for a period of some nine or ten months until I succeeded in obtaining a place as locating engineer on the Southern Pacific. Later, I had charge of construction and although my work involved gradually increasing responsibilities, I still carried the title of assistant engineer. Then in 1893 I received another setback because the coming of the great panic caused me to be thrown out of work.

"After about six months I managed to obtain work with the United States Debris Commission of California, in which I continued until about the middle of 1895, when I was appointed chief engineer of the San Francisco & San Joaquin Valley. This was a new line being built from San Francisco into southern California, which now comprises the last three or four hundred miles of the Santa Fe's entrance into San Francisco. After three years I was made general superintendent in addition to my duties as engineer of this line and upon its purchase by the Santa Fe in 1900 I was sent to Topeka as chief engineer of the Eastern Lines of the Santa Fe, later being made chief engineer of the Santa Fe System."

Thus, for a full 20 years Mr. Storey played an active part in the pioneer railway development on the Pacific Coast. In no environment does success demand greater initiative and, conversely, no conditions are more favorable to its development. That he became thoroughly imbued with a spirit of resourcefulness is evidenced by an incident in the construction of the San Francisco & San Joaquin Valley. Before a certain meeting of the board of directors he was asked what weight of rail he would recommend, and replied 60 or 65 lb. This was before the days of standard sections and he assumed that the board would give a general authority that would enable him to purchase some section between those limits where he could find the rolls already made and the price favorable. When the board adjourned the resolution which was passed had been drawn up to split the figures which he had mentioned exactly and read 62½ lb. There were no sections of this kind; the resolution of the board could not be changed for another month; no one at that time felt authorized to depart from a formal resolution of the board. As a consequence, Mr. Storey designed a section for 62½-lb. rail, had the order placed and some of the rail rolled before the next meeting of the board.

"Initiative is a very important element of success," Mr. Storey explained. "A young man should be given every opportunity to develop it. However, he cannot expect his superior to give him a free rein to exercise his own discretion until he has proven himself reliable. Once a man has demonstrated his worth, I place implicit confidence in him so long as that confidence is not violated. But that is only one element. A man must also be thorough in his work. When he is given a problem he must study it from all angles and bring to bear *all* the facts that would influence the conclusion. Therefore, when a man brings a plan to me based on his solution of a problem I will not give my approval until he has shown me that he has thoroughly mastered all the facts."

Mr. Storey's advancement from chief engineer to vice-president of construction of the Santa Fe System in 1909, to vice-president in charge of construction and operation in 1910, and to president in 1920, raises the oft-repeated question of the ability of the engineer to acquire a knowledge of railway operation and other matters outside of his own department.

"In railroad work," Mr. Storey replied, "one *imbibes* information from contact with the other departments. The engineer on a division has a variety of opportunities of learning what is going on about him. Of course, if he takes no interest in matters outside of his own work and does not keep his eyes and ears open he will learn but little, but he is making a big mistake if he does not make the most of his opportunities for mixing with men employed in the other departments. Of course, everyone knows that it is impossible to lay down any rules for the attainment of success. But, first of all, a man must tend strictly to his business and work like the devil."

It is apparent to anyone who knows Mr. Storey that he has applied this principle rigidly in his own case. He observes a rigorous self-discipline in the conduct of business routine which rarely permits of an infraction. This rule of procedure, coupled with a natural reserve, has sometimes been mistaken for austerity, but those who know him through long contact in line of service realize that this strict application to duty does not prevent him from giving expression to whole-hearted appreciation of their efforts.

"Loyalty," said Mr. Storey, "plays another important part in your success. Remember that you must work directly for the man above you and pay no attention to anyone else. This is the only way in which you can create a reputation for usefulness and ability. Men in charge of work are constantly on the lookout for men who can occupy the various positions in their organizations and when a vacancy occurs a man is much more likely to select someone whom he knows than to take a chance with an outsider, even though superficial evidence would indicate that he is a better man."

"But should not a man make sure that he is not in a blind alley?" he was asked.

"I am not much in sympathy," he replied, "with this talk of blind alleys or blind alley jobs. Every man should do what he is doing to the best of his ability and surely if he advances to the top of the particular organization of which he is a part he will be afforded a wider contact that will enable him to expand his opportunities."

The Employee's Interest in the Railway's Earning Power

NOTHING NOW is more important for the interest and welfare of the employees than that the earning power of the railroads should be restored at the earliest possible date. For it must be plain to all that some of the processes by which the railroads achieved their extraordinary improvement, in the face of declining rates and advancing costs, prior to the war, are tending to become exhausted. New methods will have to be found to increase the mileage of freight cars, to decrease the expense of handling passenger traffic, and to intensify the use of the enormous and costly terminal facilities in our cities. Whatever these new methods may turn out to be, one thing is sure, and that is that they will call for the investment of enormous sums of new capital. The possibility of increasing the production power of the railroad employees and of further advancing their standard of living will, therefore, be entirely dependent upon the ability of the railroads to raise upon their credit enormous sums of money. This money cannot be raised except upon the basis of the surety of past investments and the attractiveness of the investments still to be made. An adequate earning power in the railroads of the United States is the best friend that the railroad employee can ever have.—*Robert E. Binkerd, assistant to the chairman, Association of Railway Executives.*

FIRE IN THE SHOPS.—The shops of the Pennsylvania Railroad at Meadows, N. J., were damaged by fire on the morning of April 16 to the extent of $175,000.

Are Many Creosoted Timber Structures Destroyed by Fire?

Advantages Derived from Preservative Treatment Far Outweigh Any Possible Hazards from That Source

IN THE *Railway Maintenance Engineer* for September, 1921, page 335, there appeared an article which excited a great deal of comment among railway officers who are interested in the maintenance of pile trestles and other wooden structures. The article described the burning of a creosoted trestle on the Nashville, Chattanooga & St. Louis, in which the behavior of the fire has been generally considered as decidedly unusual. The facts brought out in this article were that the entire structure was afire for a period of about 2½ hours, after which the flames gradually subsided in spite of a strong wind and were eventually distinguished with but little assistance from the fire fighting force which had been organized in the meantime. An inspection disclosed that the condition of the structure was such as to make it entirely safe to operate trains over it.

Many railway men were unable to understand why the structure was not entirely destroyed and one reader reported his own experience with a fire in another creosoted trestle in which the flames did not subside until even the piles had been burned to the ground line. The high inflammability of newly creosoted ties and timbers is a matter of common knowledge. Piles of ties along the right of way, when exposed to fire, burn with an extreme intensity and produce a high degree of heat. Destructive fires have also occurred in cars loaded with creosoted ties and lumber, and there is also a record of a number of highway bridges, floored with creosoted timber, which suffered most disastrously when these floors caught fire.

Here, then, are conflicting facts, the correctness of which is thoroughly established in each case recorded. Clearly the question of the fire hazard in creosoted trestles is one worthy of careful study.

No Facts Available on Many Roads

Inquiry made of the officers of a large number of railroads brought replies from 34 and disclosed the rather remarkable fact that 23 of the answers were from roads which had had little or no experience with creosoted trestles or had begun the use of these trestles so recently that no data could have been developed. Of the 11 roads reporting appreciable installations of creosoted trestles, 4 had had no fires or could give no specific facts concerning them. There were, then, only 7 replies containing reports concerning specific fires or any definite data on fire losses. Obviously, these data were of too limited scope to permit of any statistical comparison of the relation between the hazards of treated and untreated timber trestles. However, several of the reports contained detailed accounts of fires from which valuable information could be gleaned for a study of this subject and much may be learned from an analysis of the various fires reported. This has been summarized in the following:

Fires During Construction or Shortly After

Hot Rivets.—On the Santa Fe a girder span was being erected on a creosoted pile pier when hot rivets fell into an accumulation of the chips at the foot of the pier and set fire to the piles. The fire spread very rapidly and destroyed the pier.

Coals From a Pile Driver.—A like condition resulted in a fire in a ballasted trestle, a part of which had been completed except for braces on the piles and a portion of the ballast flooring, while for some 18 bents only the piles had been driven and partly capped. Live coals from the pile driver, which was standing at one end of the trestle, started a fire in some rubbish at the foot of the two center piles of a bent. This was communicated to the piles, quickly reached the deck and, with a favorable wind, spread for the entire length of the trestle, including the isolated piles, a total length of 403 ft., in about 15 min. The trestle was completely destroyed.

Semi-Ballast Deck Trestle.—A ballast deck trestle on the Pennsylvania Lines West was constructed like an open deck structure, but with ⅞-in. planks set between the ties to form a continuous floor so that it could be covered with ballast as a means of fire protection. About four months after completion it caught fire from some unknown cause and was completely destroyed.

Structures in Service for a Considerable Time

The N. C. & St. L. Trestle.—A trestle of the ballasted type on the Nashville, Chattanooga & St. Louis, 108 ft. long, caught fire from coals lodging in the bulk head after about three years' service. With favorable wind the fire quickly spread the entire length of the structure, causing a fire of very intense heat. After some time elapsed the fire virtually burned itself out, when it was discovered that only a few cross braces were seriously injured by the fire. All other parts of the structure were found charred to a depth of ½ in. to ¾ in., but underneath this coating of charred wood the members were in good condition and able to carry traffic.

Three Fires on the Southern Railway.—A ballasted deck structure, 200 ft. long and 24 ft. high, two years old, caught fire from burning leaves. A bridge gang working a short distance away was able to put the fire out without trouble. The piles were charred to a depth of about ½ in., but are still in service, but it was necessary to apply new bracing. The deck was not injured.

A trestle 514 ft. long, 42 ft. high and three years old was subjected to a fire throughout its entire length, presumably from the same cause. The fire was of great intensity and lasted for about two and one-half hours, when a force of men working with buckets was able to extinguish it. While badly damaged, the structure was still in condition to carry traffic at slow speed. The presence of longitudinal as well as cross bracing added to the intensity of the fire, and this bracing was practically destroyed. The batter piles were also burned half way in two at the connections of the longitudinal girts. The stringers were badly charred but not seriously injured, because they were packed solidly together. It was necessary to overhaul the entire structure.

A trestle 17 ft. high, 390 ft. long (age unstated) was set fire by burning grass. The timbers were badly scorched and the bracing required replacing. The strength of the piles was considerably reduced, but they were not renewed. The fire was extinguished without difficulty.

Fire in Open Deck Trestles

In June, 1913, a fire destroyed a four-track trestle across Newark bay. The piles and caps of this trestle

were all of creosoted timber. Two tracks had a creosoted open deck, the other two had an untreated open deck. It is not known which portion of the structure caught fire first, but the structure was entirely destroyed. There was no evidence of any difference in the resistance of the untreated and treated wood to the effect of the fire. No part of the structure was less than a year old.

An open deck creosoted trestle 124 ft. long (age not given) was set afire, presumably from ash pan cinders. A number of the cross ties and stringers were charred, but the fire was discovered very shortly after it started and was put out with little damage. It was unnecessary to replace any material.

Fire in Creosoted Ties on Steel Bridges

Several roads report the complete destruction of the creosoted ties on steel bridges. One case is of particular interest. Fire was discovered by an automobilist crossing a highway bridge close to the railroad structure. He stated that the fire started in about the middle of the bridge, and spread along the deck about as fast as a man could run. The fire was exceedingly hot and lasted about two hours, when the timber was entirely consumed. The ties were 8 in. by 12 in. spaced 14 in. centers, treated with about 16 lb. of oil per cu. ft. They had been in service about two years.

How Creosoted Wood Burns

The fundamental facts to be learned from the fire reports summarized above is that in general old treated timber does not burn as readily as that which has just recently come from the creosoting cylinder. An explanation of the behavior of a fire in treated timber has been made by Dr. Herman von Schrenk, consulting timber engineer, St. Louis, Mo., in a paper which he presented before the National Fire Protection Association.* This explanation is as follows:

"It appears that creosoted timbers when freshly treated are highly inflammable, due no doubt to the giving off of gases of a highly inflammable nature. As the creosoted timber ages, there is a marked reduction in inflammability, until after five or six months it will have the same degree of inflammability as untreated timber, and from then on becomes less inflammable. The reason for this is that the high flash point of the oil usually requires a very initial temperature to set it on fire. This is particularly true of the oils used at the present time, the flash point of which is about 280 deg. F. As the oil evaporates, the compounds left in the outer layers on the outer surface of the wood require an increasing temperature to set them on fire. As was well stated by Mr. Rollins, 'Just as this coating increases, the inflammability of the timber decreases, and finally, when all vaporization has ceased, the timber is in a measure fireproofed by the coating. It is, however, possible to ignite the timber even after this coating is formed, but it does not ignite as easily as the same kind of timber untreated and in the same state of dryness.'

"After a creosoted stick of timber starts to burn it appears to burn fiercely, making a large amount of black smoke. After the fire has gone out it will be found that a surprisingly small amount of charring has taken place, due doubtless to the fact that the heat generated by the burning of the outer layers causes the creosote oil to be fed from the inside of the stick very much after the nature of a wick; in other words, the oil burns, but the amount of heat developed is largely used up in vaporizing the oil, leaving the wood more or less protected. This has frequently been experienced on burning bridges, where the creosoted stringers have caught fire. After the fire the stringers were found to be charred, but they had been only slightly weakened, and in many instances were still able to hold up the structure."

An explanation given by Hunter McDonald, chief engineer of the Nashville, Chattanooga & St. Louis, in connection with the report of the trestle fire referred to above, is as follows:

"It was plainly evident that the fire had smothered itself, the explanation for this being that as the creosote oil burned it left a residue which accumulated on the surface of the timber to a point where the oxygen necessary to continue the combustion could not reach the unburned wood. To substantiate this explanation a small test fire was made of the chips cut from the face of the charred piles when applying cross sectional bracing to the bents. Under the heat of this fire oil was observed to ooze out readily from the chips, and the wood and oil burned vigorously until the surface became charred, after which the fire went out of its own accord."

In contrast with the decreased inflammability of creosoted timber as it ages many of the railway officers replying to the questionnaire, testified to the highly inflammable character of punky or dozy timbers, a condition commonly encountered in untreated trestles as a consequence of the effects of decay. Timber in this condition is susceptible to ignition from sparks or other sources of fire. For this reason attention is drawn to the advisability of keeping untreated wood away from creosoted structures.

Some engineers are of the opinion that the intensity of the creosoting has an important influence on the inflammability of the timber. Timbers subjected to heavy treatment resulting in the presence of oil on the surface for a long time after leaving the cylinder are more susceptible to fire than those receiving only a light treatment. It has also been suggested that the density of the timber has an important influence, thus the phenomena observed in the N. C. & St. L. trestle have been ascribed in part to the fact that this was built of dense long leaf yellow pine.

Protection Afforded by the Ballast

One consideration of paramount importance in the study of the possible fire hazards of creosoted timber is the influence of the character of construction, first, as to the nature of the exposure to the source of ignition, and second, as to the retarding or accelerating influence of the construction itself. As to the first point, many engineers are agreed that the ballasted trestle offers but scant opportunity for ignition from the top. The only timber exposed to the direct action of cinders from a locomotive is that in the ties and the guard rail or curbing, and the horizontal surfaces thus exposed afford unfavorable conditions for a fire as compared with the partly inclosed recesses or pockets which are to be had in great numbers on the open deck trestle which serve to retain the heat of the incipient fire until it has a fair start, while still supplying enough draft to keep the fire going well.

In general, then, the only exposure of any importance with a creosoted ballast trestle is that derived from a grass or brush fire or the malicious or careless building of fires under the trestle by tresspassers. This opinion is verified by actual records on the Southern Pacific, Texas and Louisiana Lines, which show that in the case of practically all of the open deck trestles damaged or destroyed, the fire originated in the drippings from locomotive fire boxes, fusees or brake shoe sparks lodging in soft or decayed spots in the timber, while creosoted ballast deck trestle fires originated below from grass fires or campers' fires, which communicated with drift wood accumulated around the bents. From there it spread to the piles.

*National Fire Protection Association Quarterly, 1918.

With respect to the character of construction used, there is no question but that the closely built ballasted deck trestles tends to discourage a fire for the same reasons that the so-called slow burning or mill construction has received favor in building work. The main members are all of large sections placed close together, particularly in the case of the solid stringer type, in which a solid mass of timber is presented to the flames. But even with the open stringer type the dead air spaces between the stringers afford no draft to encourage the fire. The bracing planks, comprising the smallest section of timber used in the creosoted trestles, unquestionably comprise the most vulnerable feature of the trestle, and suffer the most from a fire, while their connections to the posts or piles serve to form pockets in which the flames are afforded opportunity to do greater damage.

The open deck trestle offers more favorable opportunity for a bad fire. The timbers are separated so as to afford draft and also intensify the affects of fire through radiation from one stick to another. It is interesting in this connection to note that E. A. Frink, principal assistant engineer, Seaboard Air Line, who reports no fire loss whatever from 70,000 ft. of creosoted timber ballast decks, is opposed to the use of creosoted timber in *open deck* trestles and for ties on steel bridges.

While the fire hazards in creosoted trestles of the ballasted type are restricted almost entirely to brush or grass fires communicating with the bottoms of the bents, attention should be called to the fact that the results of tests indicate that poles or posts set in the ground are less liable to ignition if of creosoted timber properly seasoned than if of untreated wood. The likelihood of incipient decay at this point in the untreated timber probably is a most important factor in this connection.

Admitting this advantage for the creosoted timber, the fact remains that a considerable number of the railway officers replying to the questionnaire offered recommendations for the consistent cleaning of the space around the bents of trestles to insure a minimum of material to these locations which would aid in the start of a fire.

Reference may well be made to general precautions for decreasing the fire hazards in treated timber. J. V. Neubert, engineer maintenance of way, New York Central, Eastern Lines, has issued instructions that all treated timbers shall be allowed to stand for dripping or drying off for a period of 20 to 30 days. Following this the timber is to be scraped free of all surplus oil, after which the surface of the timber is treated with a coating of sand supplied with a sand blast at a pressure not exceeding 15 lb. per sq. in. Others recommend the applying of a coating of sand or of Portland cement, but the consensus of opinion favors no treatment other than the storing of timbers for a period of approximately six months before inserting them in a structure or track. A further precaution taken by at least two roads definitely committed to the extended use of the creosoted ballast deck trestle, is the introduction of concrete piers or bulk heads at intervals to serve as a fire stop.

An excellent conclusion with respect to the fire hazards in ballasted deck trestles was prepared by the Committee on Wooden Bridges and Trestles of the American Railway Engineering Association in 1917 under the direction of A. O. Ridgway, assistant chief engineer of the Denver & Rio Grande Western, who was chairman of the Subcommittee on Ballasted Deck and Reinforced Concrete Trestles.*

This conclusion is as follows:

"In recorded instances of loss by fire of ballast deck wooden trestles the conflagration has with few exceptions originated below the deck, the ballast serving as an effectual fireproofing measure in the structure proper. While some of these cases are the resultant acts of careless or maliciously inclined persons, the far greater number are caused by locomotive sparks igniting an accumulation of inflammable debris directly under or adjacent to the bridge. It therefore follows that for carrying traffic over bodies of standing water, or streams of continuous flow, there is little, if any, fire hazard in the maintenance of ballast deck trestles and that if the surface underneath and adjoining bridges over dry washes, gulches and watercourses of intermittent flow is kept clear of inflammable material the danger of fire loss is inconsiderable. However, it should be recognized that wood in any form is combustible while concrete is immune against fire, wherefore advantage in this respect must be assigned to the reinforced concrete structure, the degree thereof depending upon the character of opening to be bridged and the thoroughness of roadway maintenance as above suggested."

Another commentary on the use of creosoted timber in trestles from the standpoint of the fire hazard is to be found in the statement made by Frank Ringer, chief engineer of the Missouri, Kansas & Texas, and it is significant that this opinion was voiced in the number of the replies received: "I believe the unquestioned economy in the use of treated timber far outweighs any question of fire hazard."

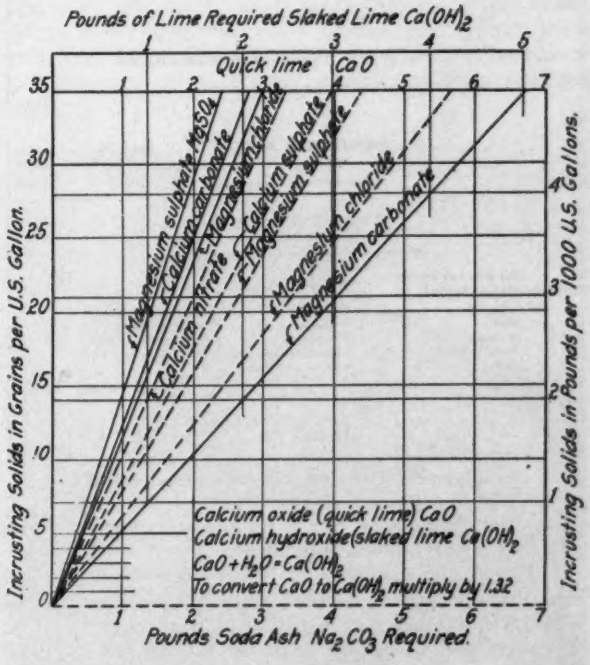
*Proceedings of the American Railway Engineering Association, Vol. 18, p. 577.

A Lime, Soda Ash Chart

By F. D. Yeaton

Assistant Engineer Water Service, Chicago, Milwaukee & St. Paul, Chicago.

THE ACCOMPANYING chart shows the amount of pure lime and soda ash required to remove incrusting solids from water. Quite often a water analysis is given in the hypothetical combinations and one desires to determine quickly the amounts of lime and soda


Pounds of Lime Required Slaked Lime Ca(OH)2
Quick lime CaO
Incrusting Solids in Grains per U.S. Gallon.
Incrusting Solids in Pounds per 1000 U.S. Gallons.
Magnesium sulphate MgSO4
Calcium carbonate
Magnesium chloride
Calcium sulphate
Calcium nitrate
Magnesium sulphate
Magnesium chloride
Magnesium carbonate
Calcium oxide (quick lime) CaO
Calcium hydroxide (slaked lime Ca(OH)2
CaO + H2O = Ca(OH)2
To convert CaO to Ca(OH)2 multiply by 1.32
Pounds Soda Ash Na2CO3 Required.

A Chart for Determining the Amount of Pure Lime and Soda Ash to Soften Water

ash necessary to soften the water. The amount of chemicals necessary to change or remove each scaling salt may be calculated from the analysis, but is a rather tedious job and usually requires a review of chemistry.

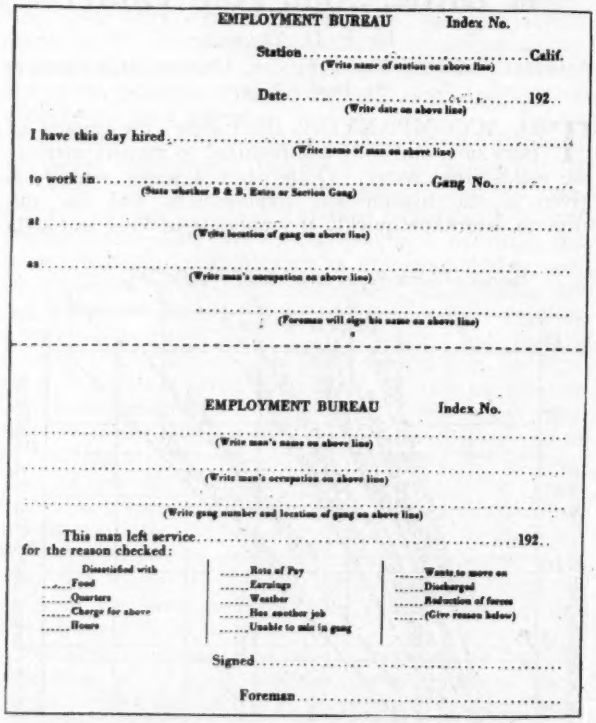
To obtain the amount of quicklime or slaked lime required, the chart should be read upward, and to determine the amount of soda ash, downward. If lime is required to remove the incrusting solids, it is shown by a diagonal full line, and if soda ash is required, it is shown by a diagonal dotted line. Where both lime and soda ash are required, the name of the incrusting solid is given over a full line and also over a dotted line.

When the purity of the lime or soda ash is known, the results obtained from the chart should be divided by the per cent of purity in each case. If the purity of the lime or soda ash is unknown, one can make a close approximation by dividing the amount of quick or lump lime obtained from the chart by 0.90, and the amount of soda ash by 0.95. The softening of water with lime is dependent on the content of available calcium oxide in the lime, and the softening with soda ash depends on the available normal sodium carbonate in the soda ash. If the analysis is given in parts per million, it is only necessary to multiply by 0.0583 to obtain grains per U. S. gallon. To convert grains per U. S. gallon to pounds per 1,000 gallons, multiply by 7.

Do Men Hired Locally Remain Longer?

By W. S. Wollner

IN THE June, 1921, issue of the *Railway Maintenance Engineer,* there was published an article entitled "Maintenance Labor Turn-Over Statistics." This article described the plan used by a western road in gathering data from which to compile maintenance labor turn-over and the reasons therefor. The article also contained statements showing the maintenance labor turn-over experience of this road for the period from April 1, 1920, to December 31, 1920, and a tabulation of the reasons given by men for quitting their jobs. The plan and statements covered only men employed through this company's employment bureau at its general offices in a city of about a half million inhabitants.



EMPLOYMENT BUREAU Index No.

Station.....Calif.
(Write name of station on above line)

Date.....192..
(Write date on above line)

I have this day hired.....
(Write name of man on above line)

to work in.....Gang No.....
(State whether B & B, Extra or Section Gang)

at.....
(Write location of gang on above line)

as.....
(Write man's occupation on above line)

.....
(Foreman will sign his name on above line)

EMPLOYMENT BUREAU Index No.

.....
(Write man's name on above line)

.....
(Write man's occupation on above line)

.....
(Write gang number and location of gang on above line)

This man left service.....192..
for the reason checked:

Dissatisfied with
.....Food
.....Quarters
.....Charge for above
.....Hours

.....Rate of Pay
.....Earnings
.....Weather
.....Has another job
.....Unable to mix in gang

.....Wants to move on
.....Discharged
.....Reduction of force
.....(Give reason below)

Signed.....

Foreman.....

Employment Card for Men Recruited Locally

Owing to the scarcity of railroad labor during the period that the report covered, fully 99 per cent of the men hired for service on the road were engaged from this metropolitan center. Conditions changed at about the beginning of 1921 in that there were men available for employment in the territory the road served, the quantity of labor available varying with the industrial and other conditions of the particular locality. The plan for gathering statistics was therefore enlarged so as to include a record of the men employed locally.

In addition to the four-card form illustrated in the former article which was used for obtaining data with reference to men hired through the employment bureau, a two-card form was put into use for reporting the employment of men locally, the date when they left the service and the reason therefor. Supplies of these cards, as shown in this article, were furnished all foremen, with instructions as to how they were to be used. The reverse side of the cards bore the printed address of the employment bureau, so that it was merely necessary to drop them into the railroad business mail for transmittal.

It will be noted that the upper portion of the card gave notice of the man's employment and this was forwarded to the employment bureau as soon as the man was engaged. All information called for was shown thereon with the exception of the index number, which was applied in the employment bureau. A code system was used, giving division reference, gang number and the man's consecutive number in the gang. When this man left the service the second card was forwarded to the employment bureau and the data shown upon it was used for the purpose intended. Pay rolls are examined at stated periods and where a man's name has been dropped therefrom without a card having been received in the employment bureau, a tracer is used and the information secured. It is believed that the data secured under this system has been as accurate as it is possible to get it without incurring unreasonable effort or expense. This data for the ten months' period from January 1, 1921, to October 31, 1921, has been arranged as follows:

Basic Data

Average maintenance of way working force during period	610 men
Total number of man-days service rendered (eight-hour day basis)	186,494

Table A

Total number of men hired during period		1,617
Hired at headquarters employment bureau	780	
Hired in vicinity of place of employment	837	
Total number of men hired during period who reported for service		1,475
Hired at headquarters employment bureau	646	
Hired in vicinity of place of employment	829	
Percentage of men hired who reported for service		91.2
As to men hired at headquarters employment bureau	82.8	
As to men hired in vicinity of employment	99.0	
Turnover of force during ten months' period		
Based on number of men hired	2.65 times	
Based on number of men hired who reported for service	2.42 times	

TABLE B

Average length of stay of men hired during period.....35.95 days
As to men hired at headquarters employment bureau .....28.51 days
As to men hired in vicinity of employment..43.00 days
Average length of stay of men hired who reported for service .....39.28 days
As to men hired at headquarters employment bureau .....34.27 days
As to men hired in vicinity of employment..43.41 days
Length of stay by periods:

	Men Hired in Metropolis	Men Hired in Vicinity of Job
No service given	134	8
1 to 10 days	227	202
11 to 20 days	108	134
21 to 30 days	77	126
31 to 40 days	58	71
41 to 50 days	43	50
51 to 60 days	30	41
61 to 70 days	13	35
71 to 80 days	8	28
81 to 90 days	16	26
91 to 100 days	7	12
101 to 110 days	13	16
111 to 120 days	7	11
121 to 130 days	3	11
131 to 140 days	5	16
141 to 150 days	11	22
151 to 160 days	2	10
161 to 170 days	2	3
171 to 180 days	12	3
181 to 190 days	0	2
191 to 200 days	0	2
201 to 210 days	0	4
211 to 220 days	1	1
231 to 240 days	1	1
241 to 250 days	2	0
271 to 280 days	0	2
Totals	780	837

Several interesting and important facts are disclosed in tables A and B. The first is the statistical confirmation of the well-founded policy of employing labor locally when it is available. Not only is the value of transportation saved, but a better grade of men is secured, as is evidenced by the fact that the average period of stay for men hired locally was 43.41 days, as compared with 34.27 days for men hired at the general office. Another interesting point brought out in these tables is that during the period which these tables cover, men, realizing that other employment was difficult to secure, particularly at compensation equal or better than that paid by the railroads, retained their jobs for a much longer stretch of time than they did during the period which previous statement covered when labor was plentiful and positions easily secured. During the period from April 1, 1920, to December 31, 1920, the average length of stay on this road for men who reported for service was 27.09 days, while it will be noted that during the following ten months which the above tables cover the average length of stay was 39.28 days, or an increase of about 45 per cent.

Another interesting point in connection with the effect of scarcity of employment is illustrated by the increased percentage of men hired who actually give service. During the last nine months of 1920, only 576, or 38 per cent, of 1,513 men who accepted employment actually went to work, while during the first ten months of 1921 82.8 per cent of the men hired through the general office employment bureau actually went to work. It is believed that conditions surrounding employment on the road which these statistics cover are as good, or possibly better, than those furnished by other roads throughout the country, yet the startling fact is disclosed that during the ten months' period it was necessary to employ 2.65 times as many men as the average force to keep it intact.

As in the previous statement, length of service has been divided in ten-day periods in addition to showing the average stay during the entire ten months. It is the belief of the compiler that an average figure does not disclose actual conditions, and this is clearly brought out by a study of the figures by periods as given in Table B. It will be noted that there is not a great deal of difference between the length of service given by men employed locally and at headquarters until 60 days is reached. Following that the length of stay is very much in favor of the men hired in the vicinity of the job. In other words, there are more "old-timers" among the "home guard" than among those shipped from the labor center.

TABLE C

Reasons given for leaving jobs:	Men Hired in Metropolis	Men Hired in Vicinity of Job
Dissatisfied with food	4	4
Dissatisfied with quarters	9	2
Dissatisfied with charge for above	0	1
Dissatisfied with hours	11	1
Dissatisfied with rate of pay	21	35
Dissatisfied with weather	13	13
Had another job	31	87
Unable to mix in gang	7	8
Wanted to move on	173	288
Discharged	62	75
Reduction of forces	23	52
Sickness	7	7
‡No reason given	344	88
Still in service	75	176
Totals	780	837

‡Where men did not report at the place of employment they were included under "No reason given"; but where they reported and did not accept employment they are included under classification covering reason given for refusal to accept employment.

Table C shows that the principal reason for maintenance laborers quitting their jobs is still the call of the road. In other words, they "want to move on." It will be noted that more men hired in the vicinity than hired at headquarters quit on account of dissatisfaction with rates of pay and because they had other jobs. The same explanation applies to both of these items, and that is, many of the men hired locally accepted employment during shut-downs of nearby industries which paid higher wages for the more expert work they were able to do. When these industries again offered employment these men returned to them, some of them giving the reason that they had other jobs and others that they could get better pay there.

A Big Dipperful

1921 Rail Production Was Low

ACCORDING to statistics issued by the American Iron & Steel Institute, New York, the production of rails in the United States during 1921 was the lowest in any year since 1914. In fact, except for 1914 and 1908, the output of rails in 1921 was the lowest since 1898. The total, 2,178,818 gross tons, is less by nearly one-half million than the total for 1920, which was 2,604,116 tons.

PRODUCTION OF RAILS BY PROCESSES, GROSS TONS.

Years.	Open-hearth.	Bessemer.	Rerolled.*	Electric.	Iron.	Total.
1907	252,704	3,380,025	.....	.....	925	3,633,654
1908	571,791	1,349,153	.....	.....	71	1,921,015
1909	1,256,674	1,767,171	.....	†	.....	3,023,845
1910	1,751,359	1,884,442	.....	†	230	3,636,031
1911	1,676,923	1,053,420	91,751	462	234	2,822,790
1912	2,105,144	1,099,926	119,390	3,455	.....	3,327,915
1913	2,527,710	817,591	155,043	2,436	.....	3,502,780
1914	1,525,851	323,897	95,169	178	.....	1,945,095
1915	1,775,168	326,952	102,083	.....	.....	2,204,203
1916	2,269,600	440,092	144,826	.....	.....	2,854,518
1917	2,292,197	533,325	118,639	.....	.....	2,944,161
1918	1,945,443	494,193	101,256	.....	.....	2,540,892
1919	1,893,250	214,121	96,422	50	.....	2,203,843
1920	2,334,222	142,899	126,698	297	.....	2,604,116
1921	2,027,215	55,559	96,039	5	.....	2,178,818

* Rerolled from old steel rails. Included with Bessemer and open-hearth steel rails from 1907 to 1910 inclusive. † Small tonnages rolled in 1909 and 1910 but included with Bessemer and open-hearth rails for these years.

The production of Bessemer rail suffered a further decrease, indicating that Bessemer rail is nearly obsolete. In 1921 the tonnage of Bessemer rail was 55,559 as compared with 142,899 tons in 1920, the percentages of the total production being 2.55 and 5.49 per cent for the two years respectively.

PRODUCTION OF RAILS, SHOWING DECREASE BY PROCESSES, 1920-1921

Kinds.	1920.	Per cent.	1921.	Per cent.	Decrease.	Per cent.
Open-hearth	2,334,222	89.63	2,027,215	93.04	307,007	13.15
Bessemer	142,899	5.49	55,559	2.55	87,340	61.12
All other	126,995	4.88	96,044	4.41	30,951	24.37
Total	2,604,116	100.00	2,178,818	100.00	425,298	16.33

As a means of correcting the above tables of rail production to eliminate rails not used on the steam railroads, the following data on the production of girder and high T-rails are of considerable value. For recent years the tonnage was as follows: 1916, 127,410; 1917, 91,674; 1918, 20,834; 1919, 112,712; 1920, 100,910; 1921, 89,162 gross tons. Deducting these figures from the production tables above, will give more representative figures for the use of steel rails by the railroads, except, however, that it does not take into account the effect of imports and exports of rails.

The total production of rails as given above includes, in addition to new rails rolled, rails rerolled from defective rails and from old rails. The total of renewed or rerolled rails so included is given in gross tons below.

PRODUCTION OF RENEWED AND REROLLED RAILS, 1914-1921.

Years.	Rerolled from new seconds, new defective rails, etc. Open-hearth.	Bessemer.	Total.	Rolled from old rails.	Total rerolled.
1914...	13,538	13,234	26,772	95,169	121,941
1915...	6,477	2,652	9,129	102,083	111,212
1916...	1,711	2,149	3,860	144,826	148,686
1917...	1,825	7,182	9,007	118,639	127,646
1918...	13,296	19,462	32,758	101,256	134,014
1919...	1,933	5,766	7,699	96,422	104,121
1920...	19,493	1,979	21,472	126,698	148,170
1921...	6,525	702	7,227	96,039	103,266

The following table shows the production of rails by weights per yard from 1906 to 1921 inclusive. A study of this table shows clearly how steady is the tendency toward the use of heavier rails. In the first place, there is a gradually increasing preponderance in the use of rails weighing 85 lb. or more, thus, in 1915 when the total tonnage rolled was only slightly greater than for 1921, only 65 per cent of the tonnage was in rails of that classification while in 1921, 80.5 per cent of the rails rolled weighed 85 lb. per yard or more. Also, in comparing the rails weighing 85 lb. but less than 100 lb. with rails weighing 100 lb. or more, it is clear from the table that there has been a steady increase in the proportion of the heavier rails and that in 1921 the rails of this class aggregated a tonnage closely approaching that of the next lower class.

PRODUCTION OF RAILS BY WEIGHT PER YARD, 1906-1921.

Year.	Under 45 pounds.	45 and less than 85.	85 and less than 100.	100 pounds. and over.	Total. Gross tons.
1906	284,612	1,749,650	1,943,625		3,977,887
1907	295,838	1,569,985	1,767,831		3,633,654
1908	183,869	687,632	1,049,514		1,921,015
1909	255,726	1,024,856	1,743,263		3,023,845
1910	260,709	1,275,339	2,099,983		3,636,031
1911	218,758	1,067,696	1,536,336		2,822,790
1912	248,672	1,118,592	1,960,651		3,327,915
1913	*270,405	†967,313	2,265,062		3,502,780
1914	*238,423	†309,865	868,104	528,703	1,945,095
1915	*254,101	†518,291	742,816	688,995	2,204,203
1916	*295,535	†566,791	1,225,341	766,851	2,854,518
1917	*308,258	†882,673	989,704	763,526	2,944,161
1918	*395,124	†665,165	888,141	592,462	2,540,892
1919	*263,803	†495,577	965,571	478,892	2,203,843
1920	*489,043	†433,333	952,622	729,118	2,604,116
1921	*211,568	†214,936	902,748	849,566	2,178,818

* Includes rails under 50 pounds. † Includes 50 pounds and less than 85 pounds.

Should the Outside Rail Be Lined to Gage?

By W. E. Schott
Arizona Eastern, Price, Ariz.

AMONG the various duties of a section foreman is one which unquestionably can be classed as of one of the most important, that of maintaining good gage on his track. There are two reasons why the gage widens on curves. The first and most common is the continuous pressure of all wheels against the outside or high rail, gradually pushing it out. The other reason, and this one is mostly observed on sharp curves with too much superelevation, is the gradual rolling out of the inside or low rail. In either case it is obviously necessary to pull the spikes on both sides of one rail, plug the holes and respike the rail in to gage. To determine which rail should be respiked is the subject of this discussion.

The writer has worked for 20 years on roads where it was required that the outside rail be gaged to the inside rail, while on other roads the rule is enforced equally strictly that the inside rail shall be gaged to the outside.

The respiking of the outside rail is the more common practice and since we know that the main pressure of rolling stock is towards this rail, it is in most cases the right thing to do, except where the low rail shows indications of rolling out, in which case it must be raised, the ties adzed it and the rail reset and respiked square with the ties. Whenever such rolling out occurs however, it will be found that there is nearly always too much superelevation and a reduction will prevent a recurrence of the rolling rail.

The other rule, to respike the low rail in all cases, is based mostly on the theory, that, admitting the outside rail is the one causing wide gage, this rail by being pushed out has imbedded the spikes more firmly in the ties, so that they offer greater resistance to any farther outward movement. This perhaps is true, but gaging the inside rail to the outside rail, if the outside rail is to blame, is practically the same as lining out the whole curve as much as the gage is wide, by keeping up this practice on a section with many curves the result will be an opening of the joints, one of the worst enemies to good track.

Any foreman with experience and average intelligence should be able to decide which rail should be left alone and which should be respiked and unless the supervisor or roadmaster has given personal instructions after looking over the curve, it should be left to the foreman to decide what to do, with the single reservation that under no circumstances should a one sided rule be followed in the gaging of curves.

The Labor Board. Back row, left to right:—A. W. Wharton, J. H. Elliott, Samuel Higgins, Horace Baker, and W. L. McMenimen. Front row, left to right:—G. W. W. Hanger, Judge R. L. Barton, and Ben W. Hooper. Albert Philips, the ninth member of the board, who has been ill for a considerable part of the last year, is not in the photograph.

Maintenance Wage Cut Discussed At Labor Board Hearing

Interesting Testimony Was Presented by Both Sides in This Important Meeting at Chicago

DURING the four days, April 10 to 13 inclusive, the United States Railway Labor Board conducted a hearing on the applications of the roads for reductions in the wages of their maintenance of way employees. The hearing was given an unusual turn by the appearance of about 35 section foremen, bridge and building foremen, laborers and the wives of maintenance of way employees as witnesses to testify regarding their living conditions and expenses in relation to the wages now being paid them.

The hearing was opened on Monday, April 10, with a presentation by John W. Higgins, executive secretary of the General Managers' Association, on behalf of the western roads, John G. Walber for the eastern roads, and W. A. Northcutt, on behalf of the southeastern roads. The statements made by these representatives of the railroads indicated that there is some variation in the nature of the requests for wage reductions being made by the roads. In general, however, the reductions proposed are 5 cents an hour for bridge and building, track and other foremen, assistant foremen and maintenance of way mechanics, and 7½ cents an hour for mechanics' helpers. In the case of track laborers, most of the roads have petitioned for authority to pay the "going rates" for common labor in the territories they traverse. The proposed arrangements on a considerable number of roads, however, vary considerably from this basis, in so far as it concerns track labor. A few roads are asking specific reductions from the present rates. Others have asked for the establishment of two or three different rates of pay for as many different localities on their lines.

The evidence presented by the railroads in support of their pleas for reductions in rates consisted primarily of a large mass of statistics covering all parts of the country, showing that the wages now being paid in outside industries for positions corresponding as nearly as possible with those in railway maintenance of way work are generally less than the rate of pay which the railroads are now required to pay their men under Decision 147. Particular stress was placed upon the fact that conditions vary greatly throughout the country, and that in some parts of the country, particularly where negro and Mexican labor is available, men are to be had at rates far below those now being paid. Commenting on the range in rates of wages, Mr. Higgins said:

"I believe the board will be impressed with the great variation in the range of rates for common labor in the different sections of the Western territory. In the Northwestern section of the territory, Oregon, Washington, Montana and North Dakota, the range is from 31 to 45 cents per hour, while in the Central agricultural and industrial districts, Illinois, Iowa and Kansas, the range drops down to from 26 to 35 cents per hour, and going down into the Southern and Southwestern sections, states of Mississippi, Louisiana, New Mexico and Texas, we find the range runs from 10 to 25 cents per hour. This, I believe, clearly shows on a broad scale the effect of local conditions on the rates of pay. The same graduation is noticeable within a state, and it can be found that there is a great discrepancy in the rates paid in the large cities, the smaller cities and rural communities within each state.

"The railroads want and are asking for wage rates that are fair, but they want the rates for each class to bear a right relation to other classes, both within and without railroad service. They are not asking for rates that approach the low level of pre-war wages—in fact, the rates the railroads propose for these classes are 50 per cent to 100 per cent higher than those in effect in 1915, and from 30 per cent to 70 per cent higher than the level of rate in 1917. We believe that such rates can

well be termed just and reasonable rates within the intent of the Transportation Act."

In answer to a question by Judge Barton, chairman of the Labor Board, as to how the board may go about the establishment of rates varying throughout the country instead of a fixed standard rate everywhere, Mr. Higgins suggested that the board take the 1917 track laborers' rates as a basis and then add to these rates, in the various territories, an amount sufficient to compensate the men for the difference between the cost of living at present and what it was in December, 1917.

The employees were represented before the hearing by Frank T. Walsh, who opened the case by citing repeated instances of a recognition of the principle of the minimum wage. He was followed by Jett Lauck, who presented a long statement, pointing to the deteriorating influences of inadequate wages and citing many decisions in recent wage disputes in which the arbiter decided against reductions. He also objected to the railway exhibits showing wages in outside industries, contending that they could not be considered as being truly "outside" because of interlocking directorates, and to bear out this contention, he listed the names of many men who are directors of a large number of different companies. In the closing argument Mr. Walsh debated the contention of the railroads that variation in living conditions justified a variation in wages. He declared that for the low paid laborer "there is not a difference of $100 per year."

Testimony was also presented on behalf of the employees by E. F. Grable, president of the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers. As a part of this testimony, he presented plans for switches, frogs, slip switches, trestles, water tanks, etc., designed to illustrate the character of construction cared for by maintenance of way employees which, he contended, indicated that a high degree of skill was necessary for the proper conduct of their work. He also presented an exhibit of personal letters from maintenance of way employees, describing living conditions. He called attention, in particular, to the fact that the form and language of these letters testified to the limited education of the writers which, in his opinion, was evidence of the effect of lowered standards of work and wages.

By far the most interesting part of the hearing was the testimony of the group of maintenance of way employees and their wives, who came to Chicago from all parts of the country. In the main these people testified as to their living expenses and in some cases went into great detail. In one instance in particular the witness was able to present complete running statements from the merchants from whom he bought clothing, groceries and other necessities for a period of considerably over a year. The principal contention of these witnesses was that, based on their statement of expenses, even the present wages are not adequate.

In their closing arguments the representatives of the roads declared definitely that the managements conceded the justice of the cost of living as a factor in wage determination, but pointed to the futility of attempting to pay men more in all positions because of economic limitations.

Mr. Higgins, in his closing argument, referred particularly to the need of differentials determined by geographical location.

"Climatic conditions are a factor. Men in the north, compared with those south, on account of severe weather conditions, must have more and heavier clothing, more and heavier food, and a greater fuel expense during seven or eight months of the year. Men in the larger terminals and cities meet conditions which men in the rural districts do not contend with. Prior to Federal Control differentials on these accounts were pretty fairly established, but the exigencies of the war made it necessary, we must assume, for the Railroad Administration to distort these relationships.

"We now ask for the western railroads that the Board restore these territorial and geographical differentials under the Transportation Act. My suggestion that track laborers' rates of December, 1917, be used as a basis was to assist the Board in finding a place to start from."

Work of the Labor Board

A statement recently issued gives a measure on the work done by the Labor Board since it was organized. During the calendar year of 1920, the board issued 42 decisions, 14 interpretations and 6 addenda, while during the calendar year of 1921 there were issued 539 decisions, 17 interpretations and 14 addenda. In 1920, the most important decision in the Board was Decision No. 2, of July 20, calling for a reduction in wages amounting to $558,000,000. During 1921, the most important work of the Board was Decision No. 147, covering a reduction in wages estimated at $378,000,000. Two other important matters completed that year were rules covering working conditions of the shop craft employees and of the maintenance of way workers. Similar decisions were rendered concerning other employees.

Court Decision Strikes at Board's Authority

A new complication was introduced into the problem of the United States Railway Labor Board on April 22, when Judge George T. Page of the Federal Court rendered a decision holding that the board had exceeded its authority in specifying the manner in which the Pennsylvania and its employees should conduct negotiations relative to rules and working conditions. This case grew out of an order issued by the board specifying the manner in which the selection of representatives of the shop employees should be carried out. The Pennsylvania obtained a temporary injunction restraining the board from censuring the road for the failure to carry out this order. Judge Page denied a petition to dissolve this injunction but his decision will be appealed.

Decisions of the Board

Pay of Employees Required to Travel

The Brotherhood of Maintenance of Way Employees and Railway Shop Laborers entered a complaint concerning a water service repair gang on the Southern Pacific Lines in Texas and Louisiana. This gang had no established headquarters but is moved from place to place as occasion requires and is not equipped with boarding cars. These men have been paid in accordance with Section I, Article V, of the maintenance of way agreement, which is as follows:

"Employees temporarily or permanently assigned to duties requiring variable hours, working on or traveling over an assigned territory and away from and out of reach of their regular boarding and lodging places or outfit cars, will provide board and lodging at their own expense and will be allowed time at the rate of 10 hours per day at pro-rata rates and in addition pay for actual time worked in excess of eight hours on the bases provided in these rules, excluding time traveling or waiting. When working at points accessible to regular boarding and lodging places or outfit cars, the provisions of this rule will not apply."

The employees contended they should be paid in accordance with section (m) of Article V, which is:

"Employees not in outfit cars will be allowed straight time for actual time traveling by train, by direction of the management, during or outside of regular work period or during overtime hours, either on or off assigned territory, except as otherwise provided for in these rules. Employees will not be allowed time while traveling in the exercise of seniority rights or between their homes and designated assembling points or for other personal reasons."

The Labor Board ruled that the nature of the employment of these men was such that Section I, Article V, applied and, therefore, sustained the contention of the railroad. (Decision No. 794.)

Demoted Assistant Roadmaster May Replace Section Foreman

Reduction in forces on the Michigan Central resulted in the demotion of an assistant roadmaster to the position of section foreman, replacing another man who was transferred to a section foremanship at another point. Representatives of the employees objected to this on the ground that the assistant roadmaster being an "official," had no seniority rights under which he could replace a man definitely under the agreement, as was the case of the section foreman. The railroad pointed to the fact that the assistant roadmaster had long been in the service of the company as a section foreman and that he had been promoted to assistant roadmaster some time before the national maintenance of way agreement was adopted and that it had long been the practice of the Michigan Central to handle demotions in this manner and that there was nothing in the maintenance of way agreement which specifically prevented this. Furthermore, it seemed a matter of common justice to retain both men in the service rather than lay one of them off, as would be the case if the employees' contention was sustained. The Labor Board confirmed the position of the railroad. (Decision No. 804.)

Knowledge of Unit Costs Valuable to the Foremen

DURING 1920 a maintenance of way unit cost report was established on the Missouri, Kansas & Texas for the purpose of determining what it was costing each gang to do the various classes of work. While the report was discontinued in July, 1921, on account of the expense involved in its compilation, many of the foremen have found that the information which they were collecting was of so much value to them that they are still keeping it up for their own information. The attitude of these men is shown by the following article, which was prepared by Joe Alsup, bridge and building foreman on the Shreveport district of this road, and published in the employees' magazine of that road:

Holding Down the Cost

Up to the time that the unit cost statements were put into effect few foremen knew much about the actual cost of the work done by them. They could give a very fair estimate of how many days it would take them to renew a deck on a 10-panel bridge or cut and cap a 15-bent bridge with a gang of 10 men, but they knew very little about the cost in dollars and cents of the different classes of repair work, such as changing caps, replacing headers and guard rail braces, surfacing, lining, etc.

With the unit cost reports each foreman can know just what each item of repairs is costing. This has helped to reduce the cost of certain kinds of work. If a foreman sees that his work is costing too much, and if he wants to make good (and I believe that every man does) he will look around to find what is wrong and make an improvement, reducing the cost of the work. A good foreman does not want his work to cost any more than the same class of work done by other gangs.

There are many short cuts that a foreman can take in making repairs on his division. To begin with, he should be a thoroughly competent bridge and building workman, watch his men closely, be careful in instructing inexperienced men how to do the work to which they are assigned with a view to their safety and maximum production and hit every lick in the right place. As far as possible he should place every man at the work at which he can make the best headway. One man is better with an adze, another with a bridge auger, and another with a cross-cut saw.

Do not have five men working at a job that three men can do just as well and in the same time. Have another job ready for a man before he is done with the one he is working on. This latter precaution will not be necessary with good, loyal men, as many of them know just what is to be done and will keep busy without being told what to do next. Do not disturb a man when he is making good time and doing good work.

Plan your work before you start on a job, be ready to line up your men, do not let them stand around and lose time by not knowing what to do. See that your tools are kept in good repair and that saws, augers and adzes are sharp. Two men can cut more timber with a sharp saw than four men with dull saws. It is a good plan to select one man to act as "a tool boss." Let it be one of his duties to look after all tools, check them out and in, morning and evening, and take a tool box out on jobs that take longer than a day. Tools should be gathered into the box at the end of each day's work. By this practice you will have tools to work with and at the same time save money on lost tools.

When working on a bridge take advantage of the opportunity to watch the structure while trains are passing over it. In this way one will sometimes find defects that would not be found in any other way. Make needed repairs while there, whether they are on your work notes or not. If there are other bridges near look over them. Some defect may have shown up since the last inspection. Aim to make all or as nearly all repairs then needed as is possible and save sending men from the other end of the division, or perhaps doubling back with the whole gang. Do not try to make as much mileage with your outfit as the local freight crew makes.

When your outfit is tied up at a station look over the buildings, whether you have any work notes on them or not. See that all doors are in good working condition, and window lights in order. The supervisor usually finds these defects and gives you notes on them, but sometimes some defect may show up the next day after being inspected by the supervisor. A supervisor should make a close inspection just ahead of the gang to avoid the unnecessary moving of the gang.

I believe that supervisors can do much missionary work by spending some time with their gangs out on the work. Some of our foremen are young men and have not had the opportunities of gaining the knowledge of handling all kinds of work that the older foremen have. We may be able to show him not only a shorter way, but an easier way to handle certain kinds of work. And even though a foreman is an experienced man it may be that we have learned some short cut from some younger foreman that we can give him the benefit of. Let every one, from the youngest man in a gang to the supervisor, do everything we can to reduce the "unit cost" and avoid all personal injuries by performing our duty in a safe way.

Making One Dollar Do the Work of Two

Hints That Help

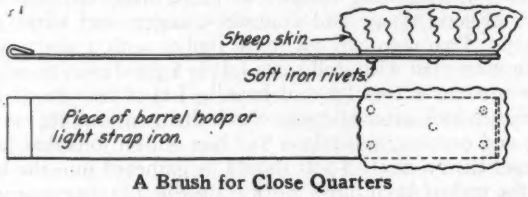
Ways That Win

A Handy Paint Appliance

By H. B. Wilson

Maintenance of Way Master Painter, Bessemer & Lake Erie, Greenville, Pa.

IN PAINTING bridges the workman occasionally encounters places where he cannot get his brush in no matter how small a brush he uses. To overcome this I have devised a swab of the style shown in the illustration. It is made by taking a piece of iron barrel hoop or strap



A Brush for Close Quarters

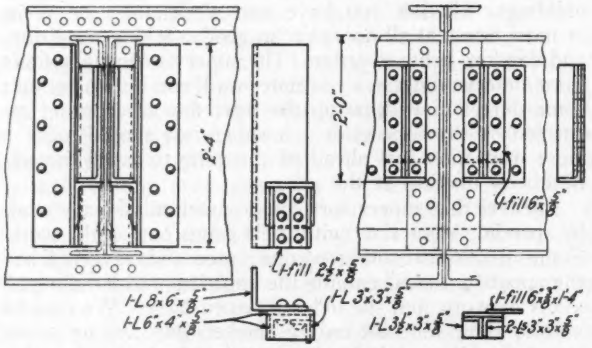
iron about a foot long and riveting to one end of this a strip of sheepskin with long wool. I use hollow soft iron rivets that are easily clinched on the wool side. This swab is inexpensive and will enter a very narrow opening.

Reinforcing Stringer Connections to Floorbeams of Steel Bridges

By R. T. Robinson

Assistant Bridge Engineer, Pere Marquette, Detroit, Mich.

ON ONE of the bridges on the Pere Marquette it became necessary to reinforce the end connection of certain stringers to the web of the floorbeams. The



Details of the Reinforcement

bottom flange of the stringer was not far enough above the bottom flange of the floorbeam to allow a bracket to be framed to the floorbeam for supporting the stringer.

As shown on the drawing, brackets were fastened (with turned bolts) to the web of the floorbeams on each side of the stringers and as close to the stringer as the make-up of the bracket would allow. These form shelves on which to support inverted brackets bolted to the web of the stringer near the end.

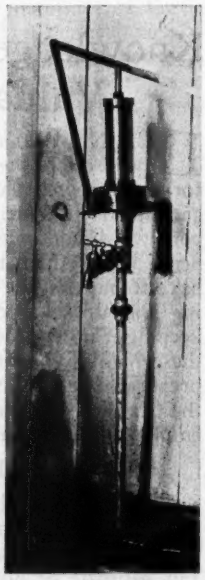
The brackets on the stringer were placed first, then those on the floorbeam. It was necessary to use care to wedge or jack the floorbeam bracket to a good bearing on the stringer bracket and then use the bracket itself for a templet to lay out the holes in the floorbeam web. This must be done to insure that the brackets will take their share of the end reaction of the stringers.

The design was worked out by C. S. Sheldon, bridge engineer, Pere Marquette.

Economical Gasoline Storage

By Clifford A. Elliott

A LARGE electric interurban line which has equipped its section gangs with motor cars has installed 12 gasoline supply stations for these cars at its divisional tool houses. At each of these points a stationary iron oil drum of 100-gal. capacity was installed 3 ft. below the ground and outside of the tool house this location permitting the storage tank to be refilled without removing the pump inside the house.

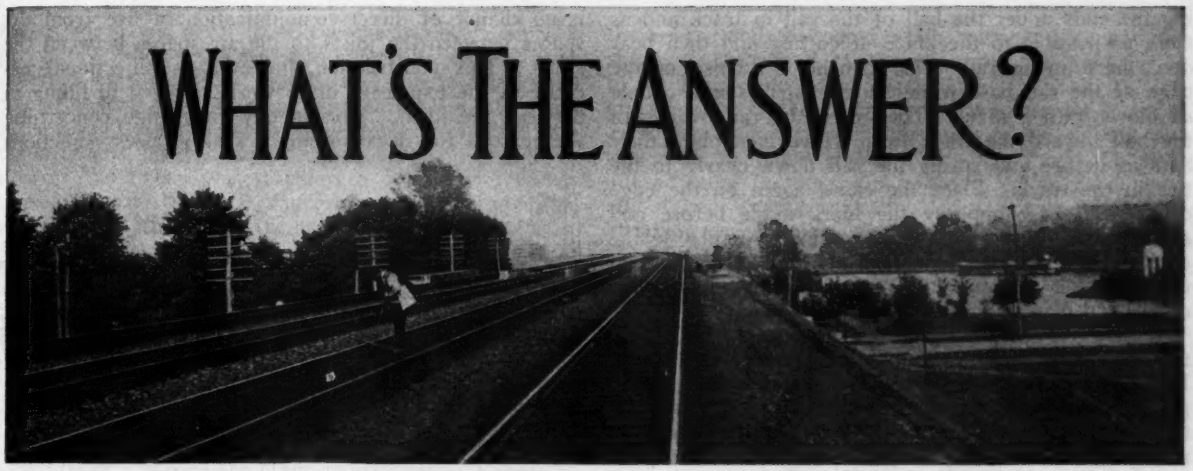


The Pump and Faucet

The oil drum is filled through an opening one foot square, which is protected with an iron cover, which is hinged and provided with a lock. A ¾-in. galvanized iron pipe extends from the 2-in. feed pipe into the oil drum to a perpendicular check valve 9 ft. below the top of the pump. A horizontal check valve is placed at the outlet faucet through which the oil is discharged into the supply tank on the section car, these two valves avoiding the necessity of recharging the pump at each pumping. Owing to the heighth of the pump above the floor of the tool house it is secured to the wall by an iron bracket to steady it during its operation.

Practically all of the materials used in these installations have been reclaimed from scrap. Obsolete air valve type trolley bases have been utilized for the pump cylinder. A new brass piston rod and cap were secured, and a brass plunger was used instead of leather, because of the destructive action of gasoline on leather. For the same reason rubber cement was used in place of white lead to seal the joints.

WHAT'S THE ANSWER?



This department is an open forum for the discussion of practical problems of maintenance of way and structures. Readers are urged to send in any questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. The *Railway Maintenance Engineer* also solicits the co-operation of its readers in answering any of the questions listed below.

The following questions will be answered in next month's issue:

(1) *What are the indications of a piped rail and how does it differ from a split head rail?*
(2) *What is the best method of cleaning exterior pressed brick walls to remove grime as well as pencil and chalk marks, etc?*
(3) *What is the best method of preventing switchmen from running locomotives over the live rails of a track scale?*
(4) *What are the three most important causes of the wear of rails on the high side of curves?*
(5) *Can soda ash or washing soda be used for reducing the time of setting of concrete? What proportion should be used?*
(6) *Does chattering of a faucet or waterhammer have any effect on the accuracy of the water meter?*
(7) *What is the best way to set or adjust the third wheel on a railway speeder to insure proper* running?
(8) *How does air in water affect the capacity of a pump with a suction lift?*

Loam and Clay in Sand

How can one determine readily whether objectional quantities of loam or other impurities are present in sand to be used in concrete?

Unfortunately there is no simple rule for judging the quality of the sand. The only sure way is to make up mortar briquettes and test them to see if they give the required strength. Finely divided clay in considerable quantities will often do the sand no particular harm. If, however, it occurs in lumps or tends to "ball" up, the sand will probably be objectional. The effect of finely divided clay or loam in sand is discussed in Taylor & Thompson book on Concrete, Plain and Reinforced, as follows:

"Lean mortars may be improved by small admixtures of pure clay or by substituting dirty for clean sand, provided it is free from vegetable matter, because the fine material increases the density. Rich mortars, on the other hand, do not require the addition of fine material, and may be positively detrimental, because the cement furnishes all the fine material required for maximum density."

The real danger from impure sand is from vegetable impurities. Quantities as small as 0.5 per cent have been known to weaken the concrete greatly. A test for vegetable organic impurities has been developed by the American Society for Testing Materials, this test having recently been adopted as standard by the American Railway Engineering Association. It is what is known as the "colorimeter test" and consists, in general, of shaking quantities of the sand in a dilute solution of sodium hydroxide (caustic soda) and noting the color of the solution after the mixture has been allowed to stand for a few hours. If the color is a dark brown the sand is very objectionable, but if a very light straw color is obtained the sand is suitable for use in very high grade concrete. Complete instructions for making this test, together with a chart showing the range in colors for different conditions of impurity, may be had by application to the American Society for Testing Materials, 1315 Spruce street, Philadelphia, Pa.

Cutting a Rail

Can a rail be cut in two with from three to five blows upon the cutter when the cut is not near the end of the rail? If so, how?

First Answer

This can be done as follows: Place two ties or timbers across the track and on these place the rail to be broken. The ties should be about three feet or a little more from each end of this rail. The rail should be about 18 in. from one of the rails in the track with the base toward the track rail. Put 12 or more men on lining bars at the place to be cut (it can be done with a few less), one-half on each side of the place to be cut. The men place their bars over the rail to be cut, catch-

ing the ends under the ball of the rail in track and as close as possible to the place of cutting and then bear down hard on the rail. One man holds a chisel on the edge of the rail base while another strikes it a couple of blows with a maul. Then turn the rail over with the ball toward the track rail. Have men place their bars as before and spring the rail down nearly to the ties in the track. Place the chisel again on the edge of the rail base opposite the mark made before and strike two or three hard blows with the maul. If the men spring the rail down hard at each blow it will usually break off square. Some rails are tougher than others and may require a few more blows.

With a very little experience rails can be broken in this manner as close as four or five feet from the end. If the piece of rail to be broken is short it is better to put the ends of the ties on which it is to be placed on the ties in track, as this gives the bar men a better chance to pry down on the rail. In hot weather it is a good idea to chill the rail with water at the point to be cut. Where short rails are to be broken the ties upon which they rest must be as close as possible to the ends. In case the ties slip on the rail when the men are bearing down, drive a track spike in each one so it will engage the rail and hold it in place. V. H. SHORE,
Foreman, Atchison, Topeka & Santa Fe, St. John, Kans.

W. F. Rench and M. L. Wheatley, extra gang foremen, Illinois Central, Millwood, Ky., both described methods corresponding very closely to that of Mr. Shore.

Second Answer

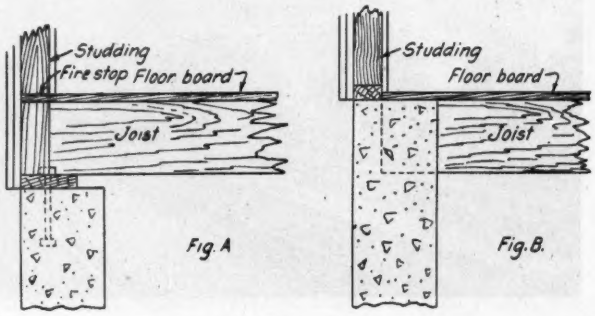
To cut a rail with as little effort as possible when the cut is not near the end, place one end of the rail under one rail in the track and over the other, with the point to be cut directly over the ball of the rest rail and cut three nicks in the edge of the flange on one side. Then turn the rail over and pour cold water on the nick and have the men spring down on the long end of the rail while one or two heavy blows are struck with the hammer directly opposite the cut that had just been made in the opposite flange. This will break the rail as smoothly as if sawed. If a rail bender is handy it may be used to put the rail under the necessary strain instead of having the men spring it. L. W. TURNER,
Roadmaster, Seaboard Air Line, Andrews, S. C.

Finishing the Foundation Wall

Is it better to end the foundation wall of a frame building with the bottom of the first floor joists or should the wall be carried up around the joists to the first floor level?

The first method is the one now commonly accepted. The second was once favored by many people, but is no longer used to any appreciable extent. The present method conforms in general to that shown in Fig. A. The top of the wall is finished with a plate, preferably anchored into the wall, this plate serving as a nailing strip to which the joists may be secured. The studs lap the joists and can be nailed securely to them. This method is subject to considerable variation. Where brick walls are installed, it is usually considered necessary to use a sill of considerable thickness instead of a 2-in. plate.

The other method is shown in Fig. B. The studs are set on the wall and then the brick or stone masons fill in between the joists and bring the wall to the level of the underside of the floor. This method of construction was particularly favored in the more northerly states because it was considered a warmer form of construction. It also provided an effective fire stop since there is no chance of direct communication of fire from the spaces between the joists to the air spaces between the studs. This construction, however, is objectional because of the expensive brick work involved in filling in between the joists. Present day knowledge concerning the reasons for decay in timbers also raises objections



Two Ways of Building the Top of a Foundation

to the encasing of the joists in the masonry since this tends to keep the ends of the joists moist and thus encourages decay. The fire stop can be provided effectively in the form of construction shown in Fig. A by carrying the floor boards to the outside of the studs by boxing around them.

To Brace Creosoted Piles Without Cutting Them

How can sway bracing be applied to creosoted pile bents without cutting into the piles to take up irregularities in their size or position?

This can be overcome very readily by using sized creosoted blocks between the bracing and the piles to make up for a variation in size or location of the piles. The necessary blocks can usually be obtained from the stock on hand. This method can be used without placing any unnecessary strain on the piles in lining up the bracing. L. W. TURNER,
Roadmaster, Seaboard Air Line, Andrews, S. C.

A. F. Robinson, bridge engineer, Atchison, Topeka & Santa Fe System, Chicago, described this same method when he was asked this question recently in a discussion of his paper on creosoted timber trestles, presented before the Western Society of Engineers which appeared in the *Railway Maintenance Engineer* for February, page 44. Mr. Robinson stated that blocks of various thicknesses were carried in stock by the bridge carpenter forces to be used for this purpose as required.

Arranging the Gas Engine Exhaust

What rule should govern the installation and design of gas engine exhaust pipes and exhaust pits to secure the best combination of engine efficiency and safety from fire?

In a gas engine plant the exhausting system often receives much less attention than it should, the only thought which frequently arises when altering the existing system being to carry the exhaust into the open air and keep any smoke away from the engine. In many cases, of course, this is the only step that need be taken, but in numerous other cases there is much advantage to be gained by studying the problem in a more scientific way. Perhaps the most important rule in exhaust system design is to provide for a free and adequate opening for

the escape of all gases to relieve the engine from back pressure. When it is desired to extend the exhaust pipe several feet, therefore, it may be advisable to enlarge the size of at least part of the pipe which is used. In many cases it is also important to avoid bends in the line, particularly such bends as cause sharp changes in the direction of the exhaust as it emerges from the cylinder. Consistent with the same principle it is usually advisable to give some attention to the area into which the exhaust discharges when leaving the pipe line. At least it should be made certain that little opportunity will arise for dust or other debris to accumulate in the end of the piping and diminish the passage. Along the same line it is usually found inadvisable to discharge the exhaust from two companion engines through the same pipe, at least until the exhaust has been conveyed some distance from each engine. The reason for this arises largely from the tendency of the exhaust of one engine to cause back pressure against the other at inappropriate times.

Aside from the principle of back pressure, too large a pipe should not be selected, or it should not be subjected to too cold an atmosphere. While consideration of this rule will make little difference in most installations, there are instances where the too rapid cooling of the exhaust atmosphere results in condensation of oils in the pipe line, which give rise frequently to back fire and to the rapid accumulation of soot in the pipe. It may also be stated that where an exhaust system extends horizontally it is usually advisable to provide some slope in the line, particularly where imperfect combustion results in a discharge of much oil in the exhaust. Passing to the design of the exhaust pit, care should be taken not to over-balance the good effects obtained by a proper arrangement of the exhaust piping. To this end a pit should be provided which is amply large. It should preferably be provided with a cover to prevent combustible materials drifting into it and, particularly where much oil is carried over with the exhaust, it should be so designed as to prevent oil accumulation owing to the fire hazard involved.

Painting Galvanized Iron

How should galvanized iron be prepared for painting?

My experience with the painting of galvanized iron has led me to believe that the best preparation is to allow it to weather for a considerable time. The length of this period varies with the conditions to which the surface is subjected. In some cases it may be as much as 18 months. The best test for this condition is when spots of rust are just beginning to show through the galvanized coating. My experience with special treatments of the galvanizing surface has been rather unfortunate. SUPERVISOR OF BUILDINGS.

Eliminating Pump Trouble

Where a pump is required to operate against considerable head, as in forcing water through a mile or more of pipe, trouble often arises in getting the pump started or in preventing the blowing out of joints, etc. How can this difficulty be avoided without extensive changes in equipment?

First Answer

The question calls to mind a situation where a gas engine was installed to force water through about two miles of pipe-line, practically all of which ran up hill. The power was sufficient for the purpose, once the water was set in motion, but much trouble was regularly encountered in establishing this condition. Unless the attendant was very careful to "ease in" the clutch between the engine and the pump when starting the pump the shock of applying the full pressure of the pump piston to the long water column suddenly would stop the engine in spite of the fact that the arrangement included a fair sized air chamber. Obviously, this condition also subjected the pumping power equipment and the pipe-line adjacent to the pump house to considerable wear and strain. In this case the condition was obviated by installing a 3-in. globe valve on the discharged line at the pump. This valve was opened wide preparatory to starting the pump and gradually closed as the column of water in the pipe-line was set in motion, the effects of the open valve, of course, being to lessen the intensity of the pressure exerted by the constant speed pump. This arrangement, of course, resulted in the loss of some water and is hardly to be preferred where sufficient air chamber space can be provided to absorb the shock. In the case in question, however, the installation of a valve was the best solution of the problem and under any conditions of this kind that arise is a method which deserves consideration.

Second Answer

With the exception of the centrifugal type of pump, which is not affected by the sudden closing of a valve on the discharge line, no important pump should be installed without making arrangements to protect it by means of a by-pass and relief valve. The ideal arrangement is to make a direct connection around the pump between the suction and the discharge lines with a by-pass line having an area at least 25 per cent that of the discharge. This by-pass line should be provided with a gate valve and a relief valve. The relief valve should be set at the maximum allowable or necessary working pressure for the pump. When the operator starts the pump he has the gate valve wide open and leaves it in this position until pumping is well under way, part of the water going through the discharge and part back into the suction by means of the by-pass. The gate valve is then gradually closed, forcing all water into the discharge line, and if the pressure is built up too rapidly the relief valve then operates to protect the pump as well as the pipe line.

EDWIN M. GRIME,
Supervisor Bridges and Buildings, Northern Pacific, Fargo, N. D.

Third Answer

Where severe shocks or water hammer are experienced in starting a piston pattern pump caused by the delivery of water through a long discharge line, the trouble may be satisfactorily eliminated by the following method, which is applicable to the average railway pumping station. Place in the discharge line, close to the pump, a tee with a run the same size as discharge pipe and with about a 4 or 6 in. outlet. Extend a 4 or 6 in. pipe from the tee outlet to the suction well, or discharge same to suit local conditions. In this 4 or 6 in. line adjacent to the tee outlet install a wheel turn-gate valve the same size as the pipe. Screw or flange connections should be used. In starting the pump have this gate valve wide open and waste the water until the pump is at full speed, then very slowly close the valve and the total discharge from the pump will gradually be forced through the long discharge line without shock or hammer to the pump. A gate valve so installed is known as the starting valve.

Leaks or shocks in a long discharge line caused by water hammer, if not too severe, may be eliminated by the installation of an air chamber in the line. This chamber may be easily made by installing a tee in the pipe line with a run of the same size as that of the discharge line and with an outlet on the tee of 4 or 6 in. in diameter. Install in a vertical position a 4 or 6 in. diame-

ter pipe 3 or 4 ft. long, with cap on end. Use flange or screw connections. The air compressed in the vertical pipe or air chamber will take up the shock or pulsations from the pump.

If the trouble from breaks or leaks in the line is particularly severe one or more relief valves should be installed in the line and the adjusting spring in the valve regulated to discharge at a pressure slightly less than the pipe or joints are capable of standing. A valve similar to the Golden-Anderson automatic cushion relief valve may be used. The valve may be installed in a concrete pit and be connected to the drain or discharged into a French drain. The valve should be installed on a tee placed in discharge line. In a long discharge line there may be one or more sudden dips and when such conditions exist a gate valve should be installed to clean out the line, which will materially eliminate shocks or water hammer. It is often the case that water hammer is caused entirely from the fact that there are too many unnecessary sharp, short radius bends in the line. and the entire trouble from starting the pump or from leaks in the line may be eliminated if the line is made as straight as possible from the connection at the pump to the very end of the line.

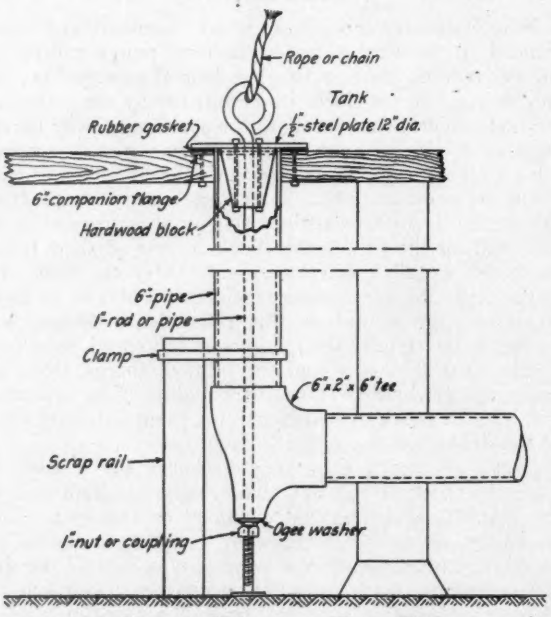
W. B. PIERCE,
Engineer Water Supply, Southern, Washington, D. C.

Further Answers to Old Questions

The following are further answers to questions which were answered in earlier issues.

An Additional Answer to a Question in the February Issue

In the March issue of the *Railway Maintenance Engineer* there was published an answer to the question, "What is a practical design for a valve control cleanout opening or drain in the base of a water tank that will not freeze in the winter?" The accompanying illustration shows a tank drain which was designed especially to provide against freezing and which has worked out very satisfactorily in service. As will be seen, a flange is bolted on the inside of the tank floor and a 6-in. pipe extended to the ground, where a 6-in. by 2-in. by 6-in. tee is attached in such a way that the 2-in. opening faces the ground. The valve proper consists of a tapered wooden plug somewhat smaller in its largest dimension than the diameter of the pipe and a plate to which it is attached. This plate carries a rubber gasket and fits snugly against the flange in the tank floor. The eye-bolt in the top of the plate provides the means of lifting the valve and the rod extending down the center of the pipe holds the valve in place at all times. When it is desired to remove the valve it is only necessary to unscrew the nut at the lower end of the rod and pull up the plug. There is nothing about the device to freeze and the tank can be drained perfectly dry and cleaned without the resultant splashing of sludge upon or around it.



A Cleanout Valve for a Water Tank

B. W. DE GEER,
Engineer Water Service, Great Northern Railway, St. Paul, Minn.

Finding the Frog Numbers

What is a simple method for determining the number of a frog?

Two answers to this question appearing in the March issue of the *Railway Maintenance Engineer* require that you find the point of frog. Usually when a frog is to be renewed it is badly worn about the point and if the stock rails are out of gage and the guard rail is closer to the stock rail at one end than at the other, the wear on the frog will be unequal and one cannot locate the point of frog accurately. The method I use makes it unnecessary to locate the point at all. I measure the spread of the frog at both the heel and the toe, add them together and divide the length of the frog by this sum. This will give the correct frog number. In taking these measures be sure to take them all from the running line or gage side.

WILLIAM L. COLLINS,
Foreman, Union Pacific, Junction City, Kans.

Short Line Kinks In Stone Ballasted Track

How can short line kinks be kept out of stone ballasted track?

The only way to keep short line kinks out of stone ballasted track is to keep the track well maintained with sufficient shoulder on the ballast section to hold it. Once the line kinks get into the track in stone ballast there is only one proper way to get them out and that is to give the track a light lift. It will do no good to line the track without lifting it since this only serves to roll the stones that are under the ties and the first train that comes along will roll them back again so that the track will be just where it was. For very short kinks the only practical way to get rid of them without raising the track is to "spike line" it, but this, of course, is objectional unless absolutely necessary.

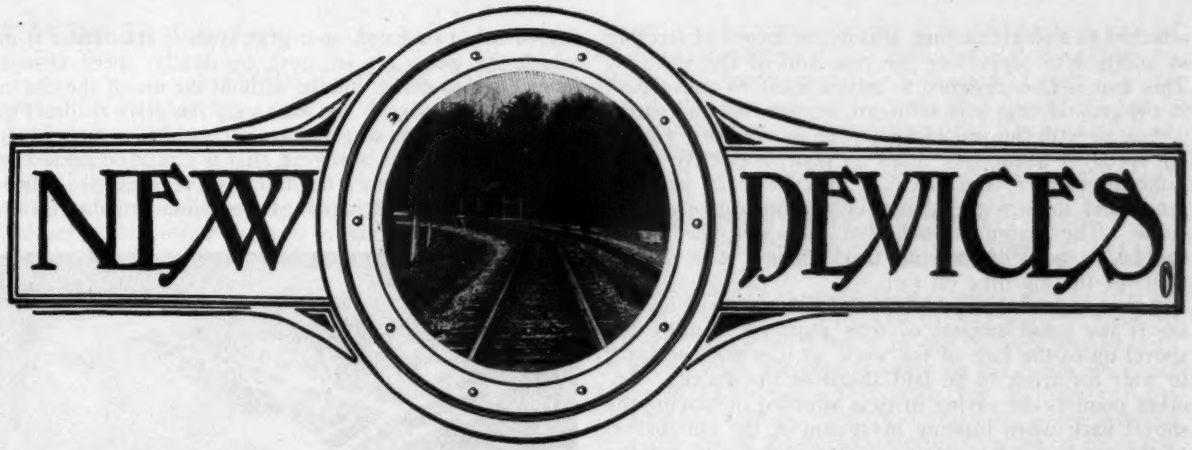
TRACKMAN.

Shoulders on Tie Plates

Why are tie plates made with the shoulder on the outside only instead of on both sides?

In my opinion, tie plates are provided with the shoulder on the outside only because tie plates so equipped protect the track from spreading and hold the rails to gage. They are easier to handle when renewing ties and rails. They are easier to remove and to replace. They can be repunched easily for use with a rail having a different width of base. Tie plates with an inside shoulder have only one advantage over a tie plate with only an outside shoulder. They help to keep the ties square with the track.

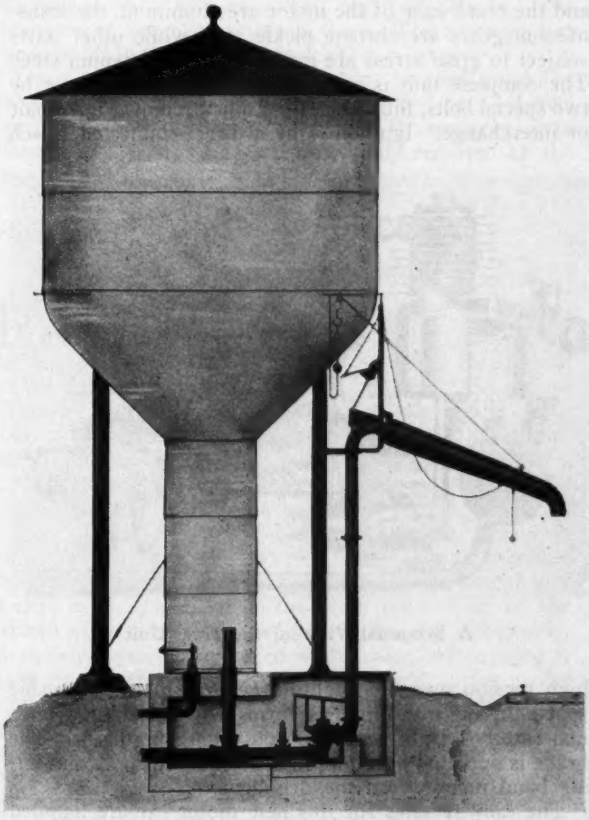
SECTION FOREMAN,
Belt Railway of Chicago.



A New Delivery Spout for Steel Water Tanks

AMONG RECENT developments in railway water service appliances is a new delivery spout for a roadside tank designed to give the maximum insurance against freezing. The arrangement comprises a combination of a steel tank with a complete water column. The spout is served by a self-draining riser pipe direct-connected to a valve of approved construction installed in a concrete pit extending under the large riser pipe of the tank. The water column is always empty when water is not being discharged as it is drained though a self-operating drip valve which is an integral part of the outlet valve. The water column is supported by a steel frame rigidly connected with the supporting columns under the tank and the connection of the delivery facilities to the riser of the tank is by means of a common outlet and inlet pipe as shown in the illustration, or if desired the outlet may be made independent of the line delivering the water to the tank.

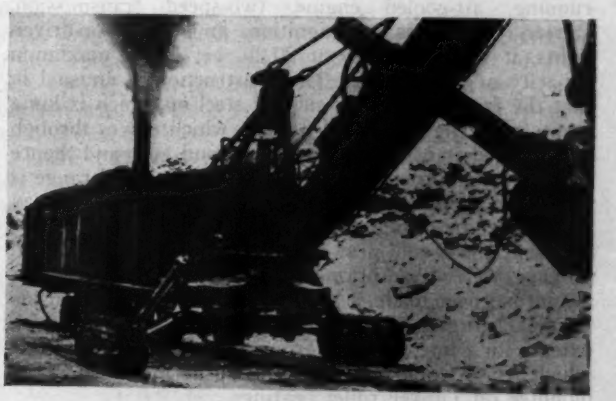
This arrangement of non-freezing tank spout has been devised by the Chicago Bridge & Iron Works, Chicago, and has been installed on a number of steel water tanks manufactured by that company. It is said to have demonstrated its effectiveness in overcoming the tendency to freeze with excellent results. Among other advantages of the arrangement to which attention has been called is the fact that there are no moving parts inside the tank to be blocked by ice, that the operating mechanism is simple because all moving parts are outside and that by the addition of a gate valve it is possible to cut off the discharge valve so that it may be inspected and tested.



Sectional View of the Tank and Spout

A Railroad Type Shovel With Caterpillar Treads

THE BUCYRUS Company, South Milwaukee, Wis., has developed caterpillar traction for its railroad-type steam shovels, as will be noted in the accompanying illustration. The mounting consists essentially of two forward caterpillars, which replace the customary jack arms, together with a rear caterpillar unit having a smaller spread between treads. The forward caterpillars, which are the drivers, are designed to adjust themselves to considerable unevenness of the ground as well as to permit the transmission of the propelling power to one center load or to both, thus facilitating steering, which is done with the rear caterpillar.

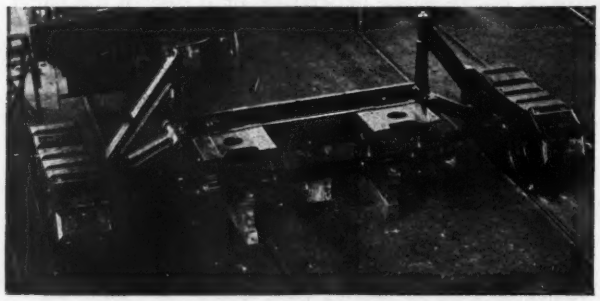


Caterpillar Mounted Railroad Shovel in Service

The rear caterpillar unit, which consists of two treads

attached to a single casting, affords the means of steering in addition to supporting the rear end of the machine. This unit is also designed to adjust itself to unevenness in the ground, and both units are constructed and so coordinated wtih the propelling power as to afford a moving speed of about four miles an hour, a tractive effort sufficient to carry the machine up a 15 or 20 per cent grade and to turn the shovel in a comparatively short circle. The design is such that the caterpillar treads can be replaced by railroad trucks where it is desired to move the machine on rails.

Among the advantages claimed for this type of mounting is the small amount of time required to move the shovel up to the face of the work, as it is not necessary to wait for track to be laid ahead of the shovel. Another point is the saving in time afforded in moving the shovel back when blasting by reason of the elimination of the need of releasing and setting jacks or of making stops during this operation, the shovel always being



A View of the Forward Caterpillar Treads

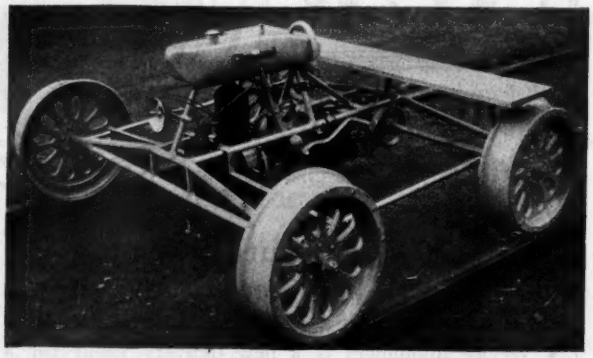
ready to dig or to move. Another advantage of these shovels in a pit is the possibility of moving them back upon high ground over-night where trouble is encountered from water running into the working pit.

New Design of Motor Inspection Car

ONE OF THE MOST recent developments in railway motor car construction is the lightweight, one-man car shown in the illustration. Equipped with a free-running, air-cooled engine, two-speed transmission, starter, clutch, magneto ignition, and generator-driven lights, it weighs but about 20 lb. yet has a maximum capacity of five people. The construction is unusual in that the framework is of tubular steel on which is hung a two-cycle engine unit of 3½ hp. which drives through a two-speed transmission and worm and gear and thence by chain and sprocket to the wheels. The speed range is from 4 to 20 miles an hour although higher speeds may be obtained by changing the sprocket ratios.

The frame is cold-drawn, seamless steel tubing, 12 and 13 gage, welded and brazed in a truss design. Wherever a joint has been made, it has been reinforced on the inside by a steel forging of the proper shape, the arms of which extend for some distance from the joint. The wheels which are of wood with steel rims 14 in. in diameter, are mounted on Timken roller bearings.

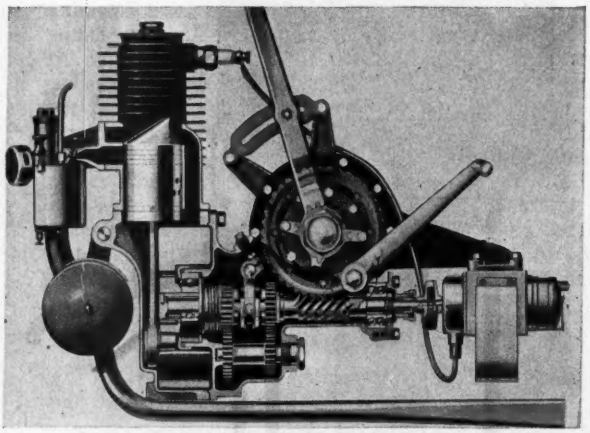
The power plant is of the unit type, i. e., the engine, transmission, clutch, starter and magneto are all rigidly held together as one unit. It is manufactured by the Cleveland Motorcycle Manufacturing Company, Cleveland, Ohio, and is a standardized unit, the parts for which are interchangeable with the parts for motorcycles carried by regular dealers. The engine proper is valveless, being a two-cycle, three-port, air-cooled, single cylinder 3½ hp. motor with a bore and stroke of 2¾ in. It is direct-connected to a two-speed, spur-gear type of transmission in which the gears are in mesh constantly, speed change being effected either with or without the use of the clutch by means of "dogs." On high gear the drive is direct to an alloy steel worm of generous pitch which in turn drives a titanium bronze worm-gear, that is clutch-connected to the driving sprocket. The clutch is a multiple-disc, automobile type with 13 hardened steel discs running in oil.



Light Yet Rigid Construction Characterizes the New Car

It is controlled by a hand lever mounted on the side of the unit, a feature which permits the engine to be started while the car is standing still or to be left running free when so desired. An innovation is a kick starter, as it is commonly called, so arranged that the operator can start the motor from the seat of the car by pushing on a pedal with his foot. One stroke of the starter causes four revolutions of the motor.

All bearings of the motor crankshaft and the transmission unit are ball bearing. The transmission housing and the crank case of the motor are aluminum, the transmission gears are chrome nickle steel while other parts subject to great stress are made from molybdenum steel. The complete unit is suspended from the car frame by two special bolts, thus permitting quick removal for repair or interchange. Ignition is by a direct-connected Bosch



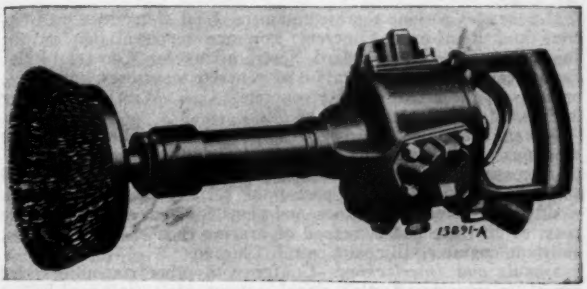
A Sectional View of the New Unit

high tension magneto; lighting current for a removable spot light and a tail light is furnished by a chain-driven, non-battery type of generator and voltage regulator. The brake is operated by a foot pedal connected to a contracting band mounted on the driving axle.

The railway sales for this new motor car are handled by Craft, Incorporated, 52 Vanderbilt avenue, New York.

A Wire Brush for Cleaning Metal Surfaces

THE INCREASING use of air-driven, wire brushes for cleaning metal surfaces has demonstrated the need of high rotative speeds for the brush. This has been especially true on such cleaning work as the removing of paint, rust, dirt and scale from tanks, steel cars, structural steel forms, etc., where the area to be cleaned is large and a fast rate of work is required. The Ingersoll-Rand Company, New York, has recently brought out a high speed cleaner, known as its No. 601 "Little David" wire brush, which has a maximum speed of 4,200 r. p. m. The



The Machine Has a 6-in. Wire Brush Which Runs at 4200 r.p.m.

air motor which drives this brush is of the three-cylinder type such as has been used in that company's portable grinder. The machine is simple in construction, is well balanced and operates without vibration. Light weight has been attained by using an aluminum casing reinforced with cast-in steel bushings. The weight of the complete machine is 14 lb. with an overall length of 17½ in. The diameter of the wire brush is 6 in. The average free speed at 90 lb. air pressure is 4,200 r. p. m.

On a six weeks test this machine cleaned gondolas, each averaging 540 sq. ft. of surface, in 3½ hr. All steel box cars each averaging 1,400 sq. ft. surfaces were cleaned in 7½ hr. The brush not only removed all the rust but the old paint as well.

Portland Cement as an Ingredient in Paint

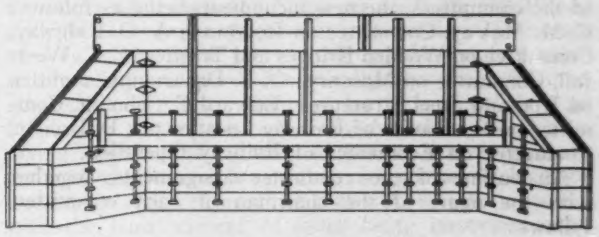
PORTLAND CEMENT as the pigment of paint is one of the newer developments in protective coatings for structures of all kinds. A new paint has been placed on the market under the name of Tnemec by the Armor Chemical & Oil Company, Kansas City, Mo. It is essentially an oil paint containing a certain proportion of linseed oil, but the secret of the vehicle is its colloidal nature, through which it is possible for it to retain the heavy cement pigment in suspension.

The material is applied like any other paint after a vigorous stirring of the contents of the container and it dries in the same manner as ordinary paint, except that it derives its particular virtue from the setting of the cement after it has been exposed to the air. Obviously, no moisture can be permitted in the paint before using it since its presence would cause the cement to set in the container, but on exposure to the air as applied in the form of a paint coating sufficient moisture is absorbed from the atmosphere to hydrate the cement, thus producing a coating which is said to be highly impervious to moisture. Experience with this paint in actual service for a period of the year and in the form of accelerated tests carried on in accordance with improved methods has led to its recommendation as a coating for steel surfaces on the ground that it resists the formation of rust. To this end it has been used on oil tanks at Kansas City, on oil tank cars and on steel viaducts of the Kansas City Railway Company.

Adjustable Forms Reduce Cost of Culvert End Walls

AN EXAMPLE of the savings which may be effected with the use of adjustable forms capable of repeated use was furnished recently in the construction of concrete end walls for pipe culverts on the Santa Fe Coast Lines in California. End walls for 10 pipe culverts ranging from 24 in. to 48 in. in diameter were installed with the use of the portable forms at a saving of nearly $290.

These forms are of a patented type built by the Zaun Manufacturing Company of San Bernardino, Cal. As shown in the drawing they consist of a combination of timber and steel. Wooden sheathing placed horizontally is held in place by vertical studding composed of steel angle bars and rods. The design is such that a single set of forms may be adjusted to fit any size of pipe from 24 in. to 48 in., and the wing forms are hinged so as to give a variable splay to the wingwalls. The same type of construction can be applied also to an all-steel form. The parts can be joined together and taken apart readily and when separated no section weighs over 75



General Appearance of the Form

lb. They are equally adaptable to single and double culverts and may also be applied to culverts of square cross section. As stated above, the end walls of 10 pipe culverts were constructed with forms of this kind, the cost of the form used on these culverts and the cost of setting up the form totaling $318.69. By a careful comparison with previous records of the form work of the kind ordinarily built for similar culverts, it is possible to make a close comparison between the cost of building these end walls with ordinary forms and with the patented adjustable forms. This comparison in the cost of form work is given in the table below.

Culvert	Kind	Cost of portable forms	Labor to set up forms	Cost to build forms on job
B-133	2 rows 42"	$186.19	$12.47	$78.75
A-149	1 row 30"		20.03	51.40
C-32	1 row 30"		16.23	51.40
A-12	1 row 42"		9.13	63.00
D-105	2 rows 42"		10.30	78.75
A-90	1 row 24"		12.10	42.67
A-96	2 rows 24"		12.10	53.33
A-15	1 row 48"		11.19	71.46
B-15	1 row 36"		16.99	58.83
D-17	1 row 36"		11.96	58.83
		$186.19	$132.50	$608.42
Cost of portable forms and placing				318.69
Amount saved by portable form				$289.73

American Railway Engineering Association

The Board of Direction has selected C. E. Lindsay, special engineer on the staff of the operating vice president, New York Central, and W. P. Wiltsee, principal assistant engineer, Norfolk & Western, as members to fill vacancies on the board created by the death of Colonel George H. Webb and the election of G. J. Ray as vice president. The 1922 edition of the Manual is now in process of being printed, and it is expected that it will be ready for distribution about July 1.

The selection of the personnel of the committees and the assignment of work to them by the Board of Direction was completed immediately following the convention six weeks ago, and a special bulletin outlining the work and giving the names of the members of the committees was in the hands of those concerned early in April. Most of the committees have already organized and more than half of them have already met.

A number of changes have been made in the chairmen of the committees, the new incumbents being as follows: C. M. McVay, Committee on Roadway; A. O. Ridgway, Committee on Wooden Bridges and Trestles; C. C. Westfall, Committee on Masonry; O. F. Dalstrom, Committee on Iron and Steel Structures; Edward C. Schmidt, Committee on Economics of Railway Location; G. D. Brooke, Committee on Economics of Railway Operation.

An outline of the committee assignments, together with the name of the chairman of each committee, follows:

Roadway.—The economics of filling bridges; the effect of heavier power and increased tonnage upon roadbed previously considered stabilized; the chemical killing of weeds; the excess costs of maintenance during the early period of operation; and the use of corrugated metal culverts in railway work. C. M. McVay, division engineer, Kanawha & Michigan, Charleston, W. Va.

Ballast.—Time and cost studies covering the application of ballast, ballast tools, the size of stone in the specifications for stone ballast, concrete foundations for crossings and tracks, mechanical tie tampers, ballasting by contract, and the cross-section outline for ballast roadbed and the forming of the same by ditchers or spreaders. F. J. Stimson, chief engineer maintenance, Pennsylvania System, St. Louis, Mo.

Ties.—Substitute ties, the care of ties after distribution, installing and keeping records of test sections of track, and the service life of ties of foreign woods in this country. W. A. Clark, chief engineer, Duluth & Iron Range, Duluth, Minn.

Rail.—The details of mill practice and manufacture as they affect rail quality; the rational relation between the intensity of pressure due to wheel loads and the resistance of various rail steels to crushing and deformation; a fair and correct method of reporting rail failures; developments in methods of rail inspection; recommended designs of rail joints and bolts; material for joint bars and methods of treatment; sections for rails over 140 lb. per yd.; transverse fissures; the most desirable length for rails, and the wear of various weights of rail under similar traffic conditions. G. J. Ray, chief engineer, Delaware, Lackawanna & Western, Hoboken, N. J.

Track.—The classification of track; typical plans of turnouts, crossovers, slip switches, double crossovers and railroad crossings; plans and specifications for track tools; specifications and piecework schedules for contracting maintenance work; plans and specifications for switch stands, switch lamps and switch locks; tests of tie plates subject to brine drippings and the effect of brine drippings on track appliances, the taper of the wheel tread and the canting of rail; the method to be used in determining recommendations for rail renewals; the curving of rails, oiling track fixtures, and method of applying the oil; and the use of guard rails on curves, including specifications to cover the conditions of degree of curvature, speed, traffic and grade. W. P. Wiltsee, principal assistant engineer, Norfolk & Western, Roanoke, Va.

Buildings.—Multiple-story freight and warehouses; specifications for buildings for railway purposes except shops and locomotive terminals; ice houses and icing stations; floors for railway buildings except shops and locomotive terminals; ventilation of railway buildings; a system for numbering railway buildings, and economical types of ornamental roof coverings for passenger stations. W. T. Dorrance, designing engineer, New York, New Haven & Hartford, New Haven, Conn.

Wooden Bridges and Trestles.—The strength of new, old and treated timber; the proper organization of bridge and building departments; a desirable system of bridges and trestles inspection, and a classification of the uses of timber and lumber under American Railway Engineering Association specifications. A. O. Ridgway, assistant chief engineer, Denver & Rio Grande Western, Denver, Colo.

Masonry.—Continue representation on Joint Committee on Concrete and Reinforced Concrete; continue representation on the Joint Committee on Standard Specifications for Concrete Pipe; factors causing the deterioration of concrete structures, and developments in the art of making concrete. C. C. Westfall, engineer bridges, Illinois Central, Chicago.

Signs, Fences and Crossings.—Specifications for highway grade crossings; various substitutes for wooden crossing planks for highway crossings and city streets; plans and specifications for round and square concrete fence posts; the relative economy of steel, wood and concrete fence posts, and plans for end, corner and gate posts of concrete and a method of bracing them. Maro Johnson, assistant engineer, Illinois Central, Chicago.

Signals and Interlocking.—Confer with other committees and report on subjects affecting signal systems, viz.: Standard ballast sections, methods of preservative treatment, switches and track details, concrete, signs for highway grade crossings, rules for conduct of signal work and guidance of signal employes, signaling and switching for classification yards, rules for operation and lighting of drawbridges, interference with signal lines, and methods of increasing track capacity. W. J. Eck, signal and electrical superintendent, Southern Railway, Washington, D. C.

Records and Accounts.—Cost-keeping methods and statistical records; plans, methods and forms for gathering and recording data for keeping up-to-date the physical and valuation records of the property of railways; the feasibility of reporting engineering data in graphic form; the feasibility of reducing the number of forms used in the engineering and maintenance of way departments; methods for recording and accounting for the determination of proper allowance for maintenance of way expenses due to increased use and increased investment, and methods and forms for keeping seniority records. H. M. Stout, record engineer, Northern Pacific, St. Paul, Minn.

Rules and Organization.—Rules for the conduct of bridge and building, signal, and telegraph and telephone work; the use of mechanical appliances and tools in maintenance of way work; and definitions covering material, work and accounting involved in the operations of the maintenance of way department. W. C. Barrett, trainmaster, Lehigh Valley, Sayre, Pa.

Water Service.—The progress of regulations of federal and state authorities covering railway drinking water supplies; specifications for contracting railway water service work; pitting and corrosion of boiler tubes and sheets; oil engines in railway water service pumping; the value of water treatment to the railways; standard methods of water analysis and interpretation of results; and the relative merits of cast-iron, steel, wood and other materials for pipe lines. A. F. Dorley, district engineer maintenance of way, Missouri Pacific, St. Louis, Mo.

Yards and Terminals.—The unit operation of railway terminals in large cities, including a revision of the catechism of unit operation of terminals as a statement of principles; passenger-station, freight-house and grain-weighing scales; handling freight on two-track-level freight houses and team tracks, also multiple-story freight houses and handling freight by mechanical means; classification yards, including methods of switching from classification yards to advance yards; and the best ways of arranging terminals to reduce preparatory leaving time and terminal arriving of trains. A. Montzheimer, chief engineer, Elgin, Joliet & Eastern, Joliet, Ill.

Iron and Steel Structures.—Specifications for the erection of steel railway bridges; the classification of bridges; specifications for turntables and turntable pits; specifications for steel highway bridges; electric welding of connections in steel structures; lighting and uniform code of regulations and signals for the operation of drawbridges; the economics of maintenance of railway bridges; rules for field inspection of existing bridges; investigations and tests of I-beams connected in groups by diaphragms and bracing; and tests and a study of the behavior of bridge pins. O. F. Dalstrom, engineer of bridges, Chicago & North Western, Chicago.

Economics of Railway Location.—The economics of railway location as affected by the introduction of electric locomotives; suit-

able units for comparing costs of maintenance of way, equipment and transportation; railway locomotive power; and methods of estimating power, speed, time and fuel consumption. Edward C. Schmidt, professor of railway engineering, University of Illinois, Urbana, Ill.

Wood Preservation.—Service test records extending them to include treated timbers in bridges, docks and wharves, and including a study of the record of service given by the zinc chloride treatment; the preservative treatment of Douglas fir; the treatment to be used in the protection of piles and timbers in water infested by marine borers; the preservative treatment of white oak ties; the relative economy of zinc chloride and creosote treatments; the proper preparation of timber for treatment including the adzing and boring of ties; the effect of preservatives on the inflammability of wood; treating of parts of wooden bridges, except piling, with zinc chloride; the development of a proper indicator for determining the penetration of sodium fluoride in wood; the preservative treatment for wood pipe staves; and the preservative treatment for signal trunking and capping. C. M. Taylor, superintendent treating plants, the Philadelphia & Reading and the Central Railroad of New Jersey, Port Reading, N. J.

Electricity.—Electrical interference with telephone and telegraph lines caused by propulsion circuits; the utilization of water power for electric railway operation; electrolysis and its effect on reinforced concrete; collaboration with the United States Bureau of Standards in the revision of the National Electrical Safety Code and other codes of similar character; overhead transmission and distribution line construction for railway use; the economics of railway location as affected by electric locomotives; railway specifications for electric light, power supply and trolley lines crossing steam and electric railways; and insulators and knife and snap switches. Edwin B. Katte, chief engineer, electric traction, New York Central, New York City.

Uniform General Contract Forms.—Forms of agreement for: private road crossing, trackage rights, joint use of passenger stations, joint use of freight facilities, and purchase of electricity. W. D. Faucette, chief engineer, Seaboard Air Line, Norfolk, Va.

Economics of Railway Operation.—The effects of speed of trains upon the cost of operation; methods for increasing the traffic capacity of a railway; methods for analyzing costs for the solution of special problems; the feasibility and economy of through routing of solid trains; and methods for the determination of proper allowances for maintenance of way expense due to increased use and increased investment. G. D. Brooke, superintendent transportation, Baltimore & Ohio, Western Lines, Cincinnati, Ohio.

Economics of Railway Labor.—Plans and methods for obtaining railway labor; standard methods for performing maintenance of way work for the purpose of establishing units of measure of work performed; and the use of labor-saving and mechanical devices. C. E. Johnston, general manager, Kansas City Southern, Kansas City, Mo.

Shops and Locomotive Terminals.—Ashpits, engine houses, power plants, shop extensions, car shops, coaling stations, typical layouts for the storage and distribution of fuel oil and storehouses. F. E. Morrow, assistant chief engineer, Chicago & Western Indiana, Chicago.

The Bridge and Building Association

The Hotel Gibson has been selected as the headquarters for the annual convention which will be held in Cincinnati in October. A campaign was launched at a recent meeting of the executive committee to bring in at least 250 new members before the next convention, and over 25 applications have already been received.

The Roadmasters' Association

The members of the executive committee and the chairmen of other committees have been asked to meet at the Hotel Statler, Cleveland, on July 9, to complete arrangements for the convention in September. Preparatory to finishing their reports the committees on Methods of Renewing Ties and The Maintenance of Motor Cars have sent questionnaires to a number of railway men interested in the subjects in order to supplement the information possessed by members of the committee with that from other roads.

The Metropolitan Track Supervisors' Club

A meeting was held at the Hotel Martinique, New York, on April 15, preceded by a "round-table" luncheon. E. H. Mills, general gas engine inspector of the New York Central, presented a paper on The Operation of Motor Cars and Tie Tampers, after which J. S. Wincrantz, of the Verona Tool Works, Pittsburgh, Pa., gave a short talk on the use of track jacks, illustrating his remarks by the use of one of that company's new track jacks. The two above subjects were discussed fully, after which the meeting took up the informal discussion of rail laying and its cost per mile. So many points were raised that it was decided to continue this subject at the next meeting, which will be held on June 10. It was decided that a designated time will be set aside at subsequent meetings for a demonstration and a talk on equipment pertinent to the general subject under discussion. Ballasting will be the general topic at the next meeting and track shovels will be the subject of a demonstration and talk by supply men.

The Wood Preservers' Association

W. H. Grady, first vice-president of the association, has assumed the duties of president following the vacancy caused by the death of F. J. Angier, noted in the last issue. A meeting of the executive committee has been called at the Sherman hotel, Chicago, on April 28, to fill the vacancy in vice-president brought about by the promotion of Mr. Grady and to transact other business.

Cutting Work Train Costs

THE OPERATION of work trains was considered by the Maintenance of Way Club of Chicago on the evening of April 19. P. J. McManus, general superintendent of the Elgin, Joliet & Eastern, opened the program with a discussion of work train service within the limits of terminals. "This service," Mr. McManus said, "is necessary in the handling of certain maintenance of way work, while other work can be handled more satisfactorily and more economically by work trains than otherwise. What we should strive to accomplish is to reduce the cost of this service to the minimum. Labor saving devices and suitable equipment are essential to this end, rail loaders, steam derricks, spreaders, locomotive cranes and cars in which materials may be unloaded with the least amount of labor being important aids. Also willing workers as well as men of experience are necessary here as in any other branch of railway service. Co-operation between departments should be given careful consideration in order that the work may be consolidated and the number of work trains reduced. In many instances, work which is ordinarily handled by work trains may be performed by crews assigned to switching service without serious interference with their regular duties.

"The clearing up of debris in large terminals, particularly where cars loaded with coal and coke are handled in large numbers, may be done by the use of a locomotive crane at a great saving over the cost of hand labor. By this means the number of men required may be largely reduced, while the cost of work trains can be eliminated entirely. By substituting an electro-magnet for the clam shell, rail or scrap may be loaded where the quantity warrants the use of a crane. It is possible to handle as many as eight rails at a time with a magnet. Likewise, when piles are to be driven, folding pile driver leads may be substituted for the boom. As such a crane is self-propelled and will handle from eight to ten loaded cars on straight level track, it will eliminate the expense of a work train in many cases.

"Where snow or other materials are to be leveled off, a spreader will take the place of several hundred men. A rail loader is particularly valuable in distributing and picking up rail and other materials. Self-clearing cars are necessary for the economical handling of ballast. Where cars built especially for this purpose are not

available, practically the same results may be obtained by steel center dump cars of the types commonly employed in coal, stone or ore service."

"In conclusion," said Mr. McManus, "the use of labor saving devices, proper equipment, the consolidation of work and the substitution of locomotive cranes will reduce the cost of work train service to the minimum."

Discussion

In the discussion of this subject special emphasis was placed on the importance of securing the proper equipment. P. J. McAndrews (C. & N. W.) deplored the frequent tendency of operating officers to assign to work train service locomotives which are unfit for revenue service and which are too light to do the work to be performed, resulting in delays and adding to the cost. Mr. McManus and others pointed out the importance of having locomotives equipped with tenders of large water-carrying capacity and in many cases of supplying them with additional tanks to eliminate the necessity of running for water and thereby delaying the gangs.

W. Shea (C. M. & St. P.) criticized many roadmasters and other maintenance officers using work trains for not issuing instructions in greater detail to all parties concerned regarding the work to be done. He urged that such a letter be sent to the trainmaster, with copies to the dispatcher, the conductor and the roundhouse foremen, so that all may be able to co-operate intelligently. T. Thompson (A. T. & S. F.) and others emphasized the importance of ordering a work train only when a sufficient amount of work is to be done to enable a full day's work to be secured. He pointed out the frequent possibility of two or more maintenance officers co-operating in the use of a train.

In referring to the unloading of ties, Mr. McAndrews urged that, where it is necessary to use work trains, arrangements be made with the stores and operating departments for ties to be delivered to the roadmaster in sufficient quantities to enable a full day's work to be secured from a work train without excessive delays to the cars. Mr. Shea described the practice of the St. Paul of unloading all ties received in box cars or coal cars in the station grounds, flat cars only being employed where ties are unloaded on main lines. It is the common practice on this road to store ties in the station grounds and to limit the quantities on a section to not more than a month's supply at one time. These ties are hauled out on the line as needed by the section forces with motor cars and trailers for distances up to a mile from the station. Where they are to be distributed beyond those points they are loaded on flat cars and unloaded with the local freight train. In this way it has been found possible to eliminate almost all trains for this purpose. Mr. Thompson and others also described their practice of using motor cars to distribute ties, it being the practice on the Santa Fe for a year's supply to be unloaded in the station yards each fall. Early in the spring the section gangs then begin to haul the ties out as they go to their work on their sections and in this way it is found possible to do away with work trains to a large extent.

In discussing the use of locomotive cranes, Mr. Shea described the development of the use of skips at a large terminal where a crane was not available. These skips are located at frequent intervals throughout the terminal. Scrap and debris are loaded in them by the track forces as they accumulate and the skips are then unloaded into gondolas by an air hoist propelled by a switch engine.

The importance of giving a track over to the maintenance of way department for its uninterrupted use where heavy work is in progress on multiple track lines was emphasized, this measure greatly increasing the output of a work train and reducing the cost of its operation, both as measured directly in train service charges and also indirectly in the labor charges.

The Material Market

FOLLOWING the change which took place early in the month of March, the market for iron and steel products has manifested a definite upward trend. This may be explained primarily by an increase in purchases such as is evidenced by an increase in the unfilled orders of the United States Steel Corporation and a growing business in structural steel. However, it is not to be denied that the coal strike with the prospect it offers for a curtailment in the manufacture of iron and steel is an important influence. Thus far, the manufacturers claim that the coal strike has not interfered with production, but the fact that the coke producers are beginning to withdraw from the market shows only too well what may be expected. The business from the railroads continues on a generous scale, one new phase being renewed attention to rail purchases. The New York Central is again in the market with an inquiry for a supplementary tonnage. The table of iron and steel prices below shows advances all along the line, with but minor exceptions.

	Prices in Cents Per Pound			
	Pittsburgh	Chicago	Pittsburgh	Chicago
	March 20		April 20	
Track spikes	$2.00 to $2.10	$2.38 to $3.48	$2.00 to $2.15	$2.38 to $2.63
Track bolts	2.90 to 3.00	3.43 to 3.48	....	3.38 to 3.43
Angle bars	.... 2.40	.... 2.40	.... 2.40	.... 2.40
Tie plates, steel	1.65 to 1.90	1.65 to 1.75	....	.... 1.75
Tie plates, iron	....	1.65 to 1.75	....	.... 1.75
Plain wire	.... 2.25	.... 2.63	.... 2.25	.... 2.63
Wire nails	.... 2.40	.... 2.78	2.40 to 2.50	.... 2.88
Barbed wire, gal.	.... 3.05	.... 3.43	3.05 to 3.15	.... 3.53
C. I. pipe, 6 in. or larger, per ton	....	.... 42.10	....	.... 43.10
Plates	1.45 to 1.50	.... 1.60	.... 1.60	1.60 to 1.80
Shapes	1.45 to 1.50	.... 1.60	.... 1.50	1.60 to 1.70
Bars	1.45 to 1.50	.... 1.60	1.50 to 1.60	1.60 to 1.70

The scrap market is in a somewhat uncertain state, but the general trend is upward, as indicated by the table below:

	Prices Per Gross Ton at Chicago	
	March	April
Relaying rails	$20.00 to $25.00	$20.00 to $25.00
Rerolling rails	13.75 to 14.00	14.00 to 14.50
Rails less than 3 ft. long	13.75 to 14.00	14.00 to 14.50
Frogs and switches cut apart	12.50 to 12.75	13.25 to 13.75
	Per Net Ton	
No. 1 railroad wrought	11.75 to 12.00	11.75 to 12.00
Steel angle bars	12.25 to 12.50	12.25 to 12.50

The consumption of lumber, as indicated by current sales, has manifested a considerable increase, both for West Coast and Southern yellow pine markets. Orders for Douglas fir have exceeded production since the latter part of March, and for four weeks this excess has averaged about 10,000,000 ft. b. m. per week. This condition has not as yet manifested itself in an advance in the prices, for, as seen in the table below, these prices have not changed appreciably.

Southern Mill Prices	March	April
Flooring, 1x4, B. and B. flat	$41.60	$41.65
Boards, 1x8, 14 and 16, No. 1	29.00	24.91
Dimension, 2x4, 16, No. 1	22.25	21.40
Dimension, 2x10, 16, No. 1, common	21.60	21.05
Timbers, 4x4 to 8x8, No. 1	19.40	19.35
Timbers, 3x12 to 12x12, No. 1	23.70	25.10
Douglas Fir Mill Prices		
Flooring, 1x4, No. 2, clear, flat	27.28	29.00
Boards, 1x6, 6 to 20, No. 1, common	12.00	10.00
Dimension, 2x4, 16, No. 1, common	13.50	11.50
Dimension, 2x10, 16, No. 1, common	13.50	11.50
Timbers, 6x6 to 8x8, No. 1, common	14.00	15.00
Timbers, 10x10 to 12x12, rough	14.00	15.00

The prices of Portland cement show but very little change. Current quotations for cement per barrel in carload lots, not including tax, are as follows:

Pittsburgh	$2.02	Milwaukee	$2.18
Detroit	2.17	Minneapolis	2.24
Chicago	1.97	Davenport	2.16
Duluth	1.94	Cincinnati	2.35

General News

The Railways of the United States should spend one and one-half billion dollars annually for the next three years in enlargements and extensions to bring their facilities up to the point in which they were in 1914 with reference to the business of the country according to W. B. Storey, president of the Aichison, Topeka & Santa Fe, in an address at Muskogee, Okla., on March 31.

Railroads Seeking Relief from a revival of railroad ticket scalping recently obtained an injunction in the Federal District courts of Kansas City, Mo., restraining all designated agents, organizations and others engaging in the business of purchasing or selling railroad tickets of any kind, from further activities of this kind, including advertising or soliciting the sale or purchase of railroad tickets. It is expected that this action will greatly assist the roads in overcoming the destructive effect of this activity upon their earnings.

The Union Pacific has recently announced its intention to spend $29,000,000 for additions, betterment, equipment and extension during the year. The construction of three short extensions is contemplated and $9,200,000 has been set aside for new equipment, of which the major portion will be for freight cars. The Pacific Fruit Express, owned jointly by the Union Pacific and the Southern Pacific, will spend $9,000,000 for betterments during the year, of which $8,000,000 will go for new equipment and $1,000,000 for a new ice plant.

Studies on the Part of Railroads operating through arid sections of the country to eliminate the tendency of dust clouds to arise upon the passage of trains, causing inconvenience and discomfort to passengers, have led the Southern Pacific to experiment with a water sprinkling system on its line between India, Cal., and Palm Springs. The sprinkler consists of a perforated pipe attached beneath the tender of the locomotive and arranged in such a way that water may be sprayed upon the track and embankment. The results secured thus far have been sufficiently satisfactory to induce the road to plan the installation of similar sprinklers on all of its passenger locomotives operating across the desert.

The Lehigh Valley is now offering accident and life insurance to all its employees at an exceptionally low rate. The company has arranged with the Travelers Insurance Co. of Hartford, Conn., to handle the insurance and makes all active employees who have been in service a year or more eligible to subscribe to it. This insurance protects the families against the employees death and provides accident benefits. The premiums are $0.80 and $0.90 and $1 a month, depending upon the occupation, for both $1,000 accident and $1,000 life insurance, these premiums being deducted from earnings. Termination of employment with the company cancels the insurance except that an employee leaving the service may continue the insurance with the insurance company without physical examination at a higher rate premium.

The Alaskan Railroad is now in service between Seward and Resurrection Bay on the coast and Fairbanks in the interior, the gap in the interior being closed on Feb. 5, 1922. Although transfer of passengers and freight is now effected through to Fairbanks, the transportation is not made completely by rail except in the winter season by reason of a crossing yet to be made over the Tanana river at Nenana. The completion of this crossing constitutes the principal item of the budget for the fiscal year of 1922-1923. Bids are now being received for the material for this crossing which will consist of a 700-ft. span bridge. Other items of interest in the budget are a steel bridge at Spencer Glacier to replace a wooden structure now in use, the ballasting of about 50 miles of line and the widening to standard gage of about 56 miles of line in the vicinity of Fairbanks. When this is completed the Alaskan Railroad will have a through line of standard gage with the total mileage of about 539.

The Railways of the United States made the best record for safety of operation in 1921 in the 34 years since accident statistics have been compiled, according to reports of the Interstate Commerce Commission. The total number of fatalities in 1921 among employees, passengers and all other persons having a right to be on railway property was 3,106 as compared with 4,329 in 1920, a reduction of over 28 per cent. The number of persons killed in industrial and other non-train accidents, including all accidents occurring in shops and other places not due to the operation of trains was 409 in 1921 as compared with 463 in 1920, or a reduction of 12 per cent. The only class of persons suffering in greater number from fatal accidents were trespassers, the number in 1921 being 2,481 as compared with 2,166 in 1920 or an increase of 14½ per cent. The total number of persons killed in 1921 from all causes was about the same as in 1889, since which the number of employees has increased about 140 per cent, the passenger traffic handled about 225 per cent and freight business about 400 per cent.

During a Recent Hearing before the Interstate Commerce Commission on the question of requiring certain railroads to install automatic train control over portions of their lines, a report was made by the Bureau of Safety which show that 106,473 train accidents occurred during the years from 1906 to 1920, resulting in 6,142 deaths, 95,936 injuries and a loss of $80,386,694. Of these accidents 17,042 were rear end collisions, resulting in 1,914 deaths, 25,974 injuries and a property loss of $21,507,894. The number of head-on collisions in the same period amounted to 9,255 with 2,412 deaths, 34,708 injuries and a total loss of $19,461,769. Of the collisions investigated by the commission which occurred in automatic block signal territory the report shows that from July, 1911, to April, 1922, there were 80 collisions directly or indirectly arising from the failure of engine men to observe or be governed by signal indications, resulting in 416 deaths, the injury of 1837 persons and a loss of $1,081,583.

Two Entirely New Plans for complete passenger and freight terminals in Chicago for all railroads now using the Dearborn, LaSalle and Grand Central passenger stations are now being prepared, according to E. J. Noonan, engineer of the Chicago Railroad Terminal Commission. One of the new plans is being prepared by the interests using the Dearborn station, the roads represented being the Atchison, Topeka & Santa Fe; the Wabash; the Monon; the Erie; the Chicago & Eastern Illinois; the Grand Trunk and the Chesapeake & Ohio. The plan embodies complete new facilities for these roads with an alternative plan which will also take care of the railroads using the LaSalle Street station and the Grand Central Terminal. The other plan is being developed jointly by the New York Central, the Rock Island and the Nickel Plate, which now use the LaSalle Street station, and the Baltimore & Ohio, the Pere Marquette, the Minneapolis, St. Paul & Sault Ste. Marie and the Chicago Great Western, now occupying the Grand Central station.

Personal Mention

Engineering

B. M. Hudson, assistant superintendent on the Trinity & Brazos Valley at Teague, Tex., has been appointed superintendent of maintenance of way with the same headquarters.

F. M. Siefer, division engineer of the Sacramento division of the Southern Pacific at Sacramento, Cal., has been transferred to the Stockton division at Stockton, Cal., to succeed J. B. Dawson, resigned.

E. L. Hoopes, supervisor on the Eastern region of the Pennsylvania, with headquarters at Huntington, Pa., has been promoted to division engineer, with headquarters at Grand Rapids, Mich., to succeed **J. K. Sherman,** who has been transferred to Fort Wayne, Ind., in place of **C. I. Barnaby,** who has been transferred to the Chicago Terminal division, with headquarters at Chicago, to succeed **R. C. Miller,** transferred to the Philadelphia division, with headquarters at Harrisburg, Pa. ,to succeed **Elmer Irving,** promoted to engineer maintenance of way of the Central Pennsylvania division.

Elmer Irving, division engineer of the Pennsylvania, with headquarters at Harrisburg, Pa., who has been promoted to engineer maintenance of way, with headquarters at Williamsport, Pa., succeeding **C. H. Niemeyer,** deceased, was born at Trenton, N. J., on January 4, 1878, and entered the services of the Pennsylvania as a rodman in the office of the assistant engineer in New York on June 15, 1895. Later he enrolled in Cooper Institute and graduated from that institution in 1900. On July 20, 1901, he was promoted to draftsman on the New York division and on April 25, 1902, he was advanced to transitman under the principal assistant engineer at Altoona, Pa. On January 1, 1903, he was promoted to assistant supervisor of the West Jersey & Seashore with headquarters at Haddonfield, N. J., being subsequently transferred to New Florence, Pa., on January 15, 1904. On August 1, 1905, he was promoted to supervisor of track with headquarters at Osceola Mills, Pa.; he was transferred to Earnest, Pa., on December 1, 1908, and to Lancaster, Pa., in 1912. On September 28, 1916, Mr. Irving was promoted to division engineer on the Trenton division with headquarters at Camden, N. J., serving at this point until May 26, 1918, when he was transferred to the Philadelphia division with headquarters at Harrisburg, Pa., where he was located at the time of his recent promotion.

Elmer Irving

T. J. Irving, whose promotion to division engineer of the Minnesota division of the Chicago & North Western, with headquarters at Winona, Minn., was reported in the April issue, was born at Clyman, Wisconsin, June 4, 1880, and graduated from the University of Wisconsin in 1905. Immediately after graduation, he entered railway service as a rodman on location and construction on the Chicago & North Western in Wisconsin, continued as a rodman, inspector and instrument man until January 1, 1908, when he served as an instrument man on maintenance at Chicago for a year. From June, 1909, to October 1, 1919, he was assistant engineer on construction, location, maintenance and valuation work and on the latter date he was promoted to division engineer and supervisor of bridges and buildings of the Southern Illinois division. He held the latter position until March 1, 1920, when he was transferred to the West Iowa division where he remained until June 1, 1921, when as a result of a consolidation of the East and West Iowa divisions, he was appointed assistant division engineer of the Iowa division, which position he held at the time of his recent promotion.

William R. Triem, whose promotion to assistant division engineer of the Logansport division of the Northwestern region of the Pennsylvania, with headquarters at Logansport, Indiana, was reported in the April issue, was born at Pittsburgh, Pennsylvania, October 21, 1886, and graduated in civil engineering from Ohio State University in 1910. Mr. Triem entered railway service as an assistant in the engineering department of the Pennsylvania at Cambridge, Ohio, immediately following his graduation, where he remained until 1912, when he was transferred to Toledo, Ohio. From 1916 to 1917, he was a resident engineer on a cutoff at Delaware, Ohio, and in 1918, he was promoted to assistant division engineer at Akron, Ohio. He remained at Akron until 1920, when he was transferred to Logansport, Indiana. While there, he again became an assistant in the engineering corps and continued in this capacity until his recent promotion to assistant division engineer.

Edwin L. Hoopes, recently promoted to division engineer of the Mackinaw division of the Pennsylvania, with headquarters at Grand Rapids, Michigan, was born at Lancaster, Pennsylvania, on December 2, 1882, and following the completion of engineering studies at Princeton University in 1904, he entered the service of a railroad contractor as a timekeeper. A year later he entered the service of the Pennsylvania as a chainman at Altoona, and on March 1, 1906, was promoted to rodman on the Conemaugh division. On February 15, 1910, he became a transitman on the staff of the chief engineer maintenance of way, and was promoted to assistant supervisor on the Conemaugh division, April 1, 1910. On March 1, 1912, he was transferred to the Trenton division, and on July 1, 1913, to the Maryland division, where he remained until May 10, 1916, when he was promoted to supervisor on the Tyrone division at Osceola Mills, Pennsylvania. On July 16, 1917, Mr. Hoopes was transferred to Hollidaysburg, Pennsylvania, where he remained as supervisor until March, 1920, when he was transferred to Huntington, Pennsylvania. He remained at this point until promoted to division engineer of the Mackinaw division, on April 1, 1922.

Track

C. S. McConnell has been appointed roadmaster on the Chicago & North Western, with headquarters at Antigo, Wis., succeeding **M. S. Hurless,** pensioned.

G. A. Owens has been appointed roadmaster on the Shore Line subdivision and the St. John terminals of the Canadian Pacific, with headquarters at St. John, N. B., succeeding **K. O. Shepard,** transferred.

J. D. Lovell, supervisor in the valuation department of the Pennsylvania, has been transferred to the maintenance of way department as supervisor of track, with headquarters at Huntington, Pa., to succeed **E. L. Hoopes,** who has been promoted to division engineer, with headquarters at Grand Rapids, Mich.

John D. Stallings, who was recently promoted to track supervision on the Mobile division of the Mobile & Ohio, with headquarters at Citronella, Ala., was born in Noxubee county, Mississippi, August 31, 1874, and entered railway service as a section laborer on the Mobile & Ohio in 1899. On October 25 of the following year he was promoted to section foreman and on October 7, 1907, became extra gang foreman. In May, 1911, he became a work train conductor and continued in this capacity until August 1, 1920, when he was transferred to the mechanical department of the Mobile & Ohio as steam derrick foreman, the position he held at the time of his recent appointment.

Bridges and Building

D. G. Musser, master carpenter on the Pennsylvania System, Central Region, with headquarters at Wellsville, Ohio, has been transferred to Cleveland.

G. W. Rear, general bridge inspector of the Southern Pacific, with headquarters at San Francisco, Cal., who was recently given the newly created title of engineer of bridges, as announced in the April issue, was born in Ontario on June 13, 1873, and attended Campbellford Collegiate Institute from 1886 to 1889, when he entered the engineering department of the Midland Railway of Canada as a student. He held various positions in this department on the Midland until its acquisition by the Grand Trunk in 1894 and continued in similar positions with the latter company until 1901, when he became connected with the Southern Pacific. His first work on this road was in steel bridge erection, in which service he was employed until April 1, 1902, when he became assistant general bridge inspector. He served in this capacity until August 15, 1905, when he was promoted to general bridge inspector, with duties similar to those of engineer of bridges, his new position.

Geo. Rear

Purchasing and Stores

H. H. Disher has been appointed purchasing agent of the Toronto, Hamilton & Buffalo Railway and of the Toronto, Hamilton & Buffalo Navigation Company, succeeding **G. W. Holmes,** resigned on account of ill health.

W. C. Bower has been appointed assistant manager of purchases and stores of the New York Central Lines, the title of general purchasing agent of the New York Central Railroad and the Pittsburgh & Lake Erie having been abolished.

A. J. Mello, recently appointed purchasing agent of the San Diego & Arizona, with headquarters at San Diego, Cal., to succeed **F. C. Howard,** was born December 20, 1866, at Jackson, Cal., and entered railway service in 1906 as a trucker in the freight sheds of the Southern Pacific at Sacramento, where he remained until March 28, 1907, when he became a clerk in the general storehouse at Sacramento. In November, 1910, he was promoted to accountant. In July, 1913, he became a stationery storekeeper with headquarters at Oakland, and in February, 1918, he was promoted to general stores inspector in the general storekeeper's office at San Francisco. In August, 1918, he was promoted to traveling storekeeper and in September, 1921, became superintendent of the commissary stores at San Francisco, the position he held at the time of his recent promotion to purchasing agent.

A Method of Studying Stresses in track was recently tried on a stretch of track of the St. Louis-San Francisco near South Webster, Mo., which is based on photography. This method consists of photographing the deflections which locomotives produce in rails according to a system whereby the vertical deflections are magnified many times. When developed the exposed films show a continuous graph of the rail deflection on the magnified scale. The inventor claims the method of investigation makes it possible to determine the rail stresses at any point for any position of load or loads, the points of maximum stress in the track, the stress in the rail joints at any point, and for any position of load or loads, the effect of the counter-balancing of the locomotive drivers, the tie reactions, and the work being done by the ballast. With a high grade moving picture camera it is said that as many as 800 pictures a second may be taken, making it possible to reproduce the rail deflections for each one and one-third inch of progress made by a train traveling at a speed of 60 miles per hour.

Construction News

The Atchison, Topeka & Santa Fe has authorized the construction of an addition to its Harvey house at Gallup, New Mexico. This company, noted in the April issue, as accepting bids for the construction of two one-story brick lavatory buildings at Chicago, has awarded the contract for this work to Jerome Moss, of that city. This company has authorized the construction of a brick combined freight and passenger station and the making of necessary track changes at Lyons, Kan. It has also begun the construction of a 7½-mile extension northeast from a point on its main line between Apperson and Burbank into the Hickman oil fields. The road which was reported in the April issue as contemplating the construction of a new division office building at Newton, Kan., has authorized the expenditure for this work together with incidental track changes. This company closed bids on April 17 for the construction of extensive additions to machine shops at Topeka, Kan., the cost of which will approximate $50,000.

The Baltimore & Ohio has awarded a contract to the Empire Engineering Company, Baltimore, Md., for the grading and masonry work on the ventilating plant on tunnel No. 1 at Ocean, W. Va. The contract for the motors and fans has been awarded to the F. B. Sturtevant Company, Boston, Mass., and the installation of the nozzle ducts and the housing of the equipment to the Virginia Bridge & Iron Works, Roanoke, Va.

The Boston & Maine is contemplating the construction of an engine house at Portsmouth, N. H.

The Canadian Pacific will continue the construction of the Edmonton, Dunvegan and British Columbia during the coming summer according to Charles Murphy, general manager of the Western lines. This line has been constructed thus far to Spirit Lake river, about 50 miles east of the Alberta, B. C., boundary line. The Canadian Pacific is working on an extension of its line from Kipawa to Les Quinze at the further end of Lake Temiskaming, 800 men being at present employed on the work. This company has a location party in the field running surveys northwest from Tuffnell, Saskatchewan, to Wadena and north from Wadena to the North Saskatchewan river in contemplation of completing a line started 15 years ago.

The Central of New Jersey is constructing a new bridge across the Lehigh river at Nesquehoning, Pa., in connection with a revision of line at this point. S. B. Mutchler & Co., Newark, N. J., has the contract for the substructure and the Bethlehem Steel Bridge Corporation for the superstructure which will be five deck plate spans each 93 ft. long. The new structure will be on a six degree curve instead of ten degrees as with the old. The cost is estimated at about $850,000. This company is contemplating some heavy grade crossing elimination work at Perth Amboy, N. J., in conjunction with the Lehigh Valley and the Pennsylvania. A total of five highway or street grade crossings and one railroad crossing will be eliminated of which four of the street crossings will be removed by the Jersey Central, and one by the Lehigh Valley.

The Chattanooga-Crossville Project is undertaking a survey for the construction of a railroad to extend from Chattanooga, Tenn., to Crossville, a distance of about 35 miles, at which latter point a connection will be made with the Tennessee Central. It is expected that the construction of this line will be completed by the end of the coming summer and that the road will traverse the largest undeveloped coal fields in that state. C. E. James of Chattanooga is in charge.

The Chesapeake & Ohio has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 500-ton reinforced concrete four track coaling and sanding plant at Peach Creek near Logan, West Virginia. This project will include stoker coal crushing and screening facilities and will cost approximately $45,000.

The Chicago & North Western closed bids April 25 for the construction of a 450-ton mechanical coaling station and ash handling facilities at Chicago avenue, Chicago, the construction of which will involve an expenditure of approximately $100,000.

The Chicago, Burlington & Quincy closed bids on April 13 for the construction of a 20 ft. by 60 ft. frame station at Plattensburg, Mo. This company has awarded a contract to the Thompson Black Company, Chicago, for the superstructure of its new five story inbound freight terminal at Chicago. It is also preparing plans and expects to call for bids in the near future for the construction of shop facilities at Denver, Colo., which will involve the expenditure of approximately $2,000,000. The contract for the structural steel for the shop has already been let.

The Chicago Union Station Company has awarded to the Mellon-Stuart Company, Chicago, a contract for track slabs for the new station project and closed bids for foundation for a boiler plant and for a retaining wall along Canal street; and also for the construction of a concrete tunnel to be used in conjunction with the boiler house.

The Eldorado & Santa Fe (A. T. &. S. F.) has applied to the Interstate Commerce Commission for a certificate authorizing the construction of three lines in Kansas, one of 3 miles in Chase county, another of 38 miles in Chase and Butler counties and another of 2½ miles in Butler county. The first and second lines with the existing line of the Atchison, Topeka & Santa Fe will furnish a direct route from Ellinor to Eldorado, reducing the haul for through trains south and west by 13.65 miles, and the third line, together with 1½ miles of the second line, will furnish a belt line around the east side of the city of Eldorado.

The Elgin, Joliet & Eastern contemplates the construction of new bridges over the Grand Calumet river at Gary, Ind., the authority for which has not yet been obtained.

The Great Northern, noted in the April issue as having closed bids on March 15 for the construction of a 30-stall roundhouse, shop buildings, storehouses and other terminal facilities at Minneapolis Junction, Minn., has awarded a contract for this work to A. Guthrie & Co., St. Paul. This company, also noted in the April issue as about to receive bids for the construction of terminal facilities at Wenatche, Wash., has let a contract to A. Guthrie & Co. for the work. The total expenditure for this project will aggregate approximately $1,500,000. This company, noted in the April issue, as receiving bids for the construction of a 500-ton reinforced concrete coaling station at Minneapolis Junction, Minn., has awarded the contract to the Ogle Construction Company, Chicago, for a plant of steel construction.

The Illinois Central, noted in the April issue as accepting bids for work incident to the construction of a third track from Matteson to Kankakee, Ill., a distance of approximately 25 miles and which was also noted in that issue as awarding a contract to M. L. Windham, Centralia, Ill., for work between Kankakee and Tucker, has awarded a contract to the Walsh Construction Company, Davenport, Iowa, for the work from Peotone to Matteson. The Bates & Rogers Company, Chicago, will do all masonry work in the vicinity of Matteson, including the extension of box culverts, the erection of overhead bridges over the Elgin, Joliet & Eastern and the construction of subways incident to the separation of grades at that point. This company closed bids on April 25 for the construction of a joint passenger station with the Toledo, Peoria & Western at Gilman, Illinois. This station will cost approximately $75,000.

The Illinois Traction has authorized the construction of about three miles of passing tracks including a number of new tracks of 30-car capacity and the extension of others to that capacity as well as the construction of yard tracks at Springfield, Ill., Peoria and Granite City, the cost of which will approximate $83,000. This company has also authorized the reconstruction and paving of 3,600 ft. of track on south Main street, Danville, Ill., the cost of which will approximate $35,000; the construction and paving of two blocks of tracks at Bloomington, Ill., to cost in excess of $9,000. The road is also contemplating the rebuilding and paving of 3,600 ft. of track on Niedringhaus avenue in Granite City, to cost about $30,000, also 1,800 ft. on Main street in Westville, Ill., at a cost of about $1,200, as well as a change of alinement at Oakwood, Ill., to cost $10,000.

The Industrial Terminal Railway contemplates the construction of a switching and terminal railway 2 miles long in Los Angeles.

The Kansas City Terminal Company has begun the preparation of plans for a passenger station at Fifth street and Central avenue, Kansas City, Kansas, for the joint use of the Missouri Pacific and the Chicago Great Western. This work will cost approximately $100,000.

The Louisville, Henderson & St. Louis has awarded a contract for the construction of a 100-ton reinforced concrete coaling and sanding plant at Owensboro, Ky., to the Howlett Construction Company, Moline, Ill.

The Mexican Railway Company (British owned) has begun surveys for a 260-mile extension of line to connect Mexico City and Tampico. This project will cost in the neighborhood of $10,000,000, and when completed will reduce traveling time of 36 to 48 hours between the two cities to about 12 hours. According to Elmer R. Jones, president of the Wells Fargo Company Express of Mexico, the intention is to commence actual construction before the end of the year. For construction purposes a separate corporation known as the Paducah-Tampico Railway Company, Ltd., has been organized with B. E. Holloway, general manager of the Mexican railways as president. The new line, it is said, will pass through a territory rich in resources but wholly undeveloped. With favorable working conditions, it is estimated that the line can be completed within two years after actual construction has begun.

The Missouri Pacific closed bids on April 14 for the construction of a pumping plant, reservoir and treating plant at Hoisington, Kan., the work to involve an expenditure of approximately $250,000. This company contemplates the renewal of the draw span and superstructure of its Osage river bridge, and the construction of two stations, one at Washington, Mo., to cost approximately $50,000 and a second at Lake Village, Ark., to cost $25,000. This company has awarded a contract for the replacing of 10 wooden trestles near Aurora, Mo., with concrete structures and earth embankments, to Jerome Moss, Chicago, Roach & Stansel, Memphis, Tenn., and Walter Denison, Cushman, Ark., who will handle the work jointly.

The Nashville, Chattanooga & St. Louis contemplates the reconstruction of its three-story brick office building at Nashville, Tenn., which was recently destroyed by fire. No definite plans have been made as yet.

The New York Central has awarded a contract to the Walsh Construction Company, Davenport, Iowa, for tunnel improvement work near Garrison, N. Y., which will consist of the excavation of an open cut in rock for two tracks to the east of the existing tracks and on line for a permanent four-track development. The estimated cost is about $500,000.

The New York & Long Branch has awarded a contract to Charles Ward Hall, Inc., New York City, for the construction of a new brick and limestone passenger station, covered platforms and roadways, etc., at Asbury, N. J., at an estimated cost of $125,000.

The Norfolk & Western has awarded a contract to H. M. Waugh, Bluefield, W. Va., for the construction of a line 1.5 miles in length from Lamberts Point to Atlantic City, Va. The work involves the laying of 7,900 ft. of main track and 1,800 ft. of spur tracks and sidings.

The Northern Pacific will spend in excess of $1,000,000 for betterments on its lines in Montana in the next few months, according to J. M. Rapelje, vice president. This program will include the erection of a $200,000 station and office building at Glendive, the replacing of its Yellowstone river bridge at Livingston with a $125,000 double track structure, the construction of a $25,000 storehouse at Butte, and the rebuilding of water stations at Pompeys Pillar, Sanders and Zero.

The Oregon Short Line has applied to the Interstate Commerce Commission for a certificate authorizing the construc-

tion of a branch line from Homedale, Idaho, in a southeasterly direction for 7½ miles.

The Pennsylvania has entered into agreements with the Ann Arbor, the Pere Marquette, the Wabash and the Union Station in Detroit, under which it has obtained trackage rights over the Ann Arbor from Toledo to Alexis Junction, from which point trains will be operated over the Pere Marquette to Carlton, thence over 20 miles of line to be constructed by the Pennsylvania to a point in the vicinity of Delrey, beyond which the trains will be operated over the Wabash to River Junction and thence into the Union Station. Included in the 20 miles of new line to be constructed by the Pennsylvania in the near future, will be a terminal yard near Delrey. The Pennsylvania Railroad has authorized the expenditure of $8,000,000 for improvements in the vicinity of Pittsburgh, Pa. At Pitcairn, 12 additional stalls of the reinforced pre-cast concrete type with drop pits and other facilities will be added to the existing facilities, making a full 34-stall house. The old 100-ft. turntable will be removed and the stalls connected up to a 110-ft turntable now in place. The estimated cost of this work is about $380,000.

At the Sharpsburg yard, additional running and yard tracks will be constructed and present tracks and layout consolidated to form one unit of a final yard development at that location. A part of this work will include two main freight running tracks from Etna to Aspinwall. The estimated cost is $776,000.

The line from the west end of the Sharpsburg yard (Etna) will be extended to Thirtieth street, a distance of about three miles, at a cost of about $713,000. This forms an extension of the four track system and will require the construction of two additional main tracks and the rearrangement of the existing tracks.

The construction of the Kenwood to Rochester low grade line on which work was suspended in 1921 will be resumed and about $1,623,000 expended. This line will be double track from Kenwood Junction, Pa., along the Beaver river to West Rochester, Pa., and will have a maximum grade of 0.3 per cent compensated.

Two other items of improvement work, regarding which the exact location and details have not been announced as yet, include about one and one-half miles of heavy grade separation and crossing elimination work to cost about $2,365,000; and the enlargement and improvement of a yard and the construction of additional connecting tracks at a cost of nearly $2,000,000.

In addition to this program, bids have been closed for a through truss overhead, highway bridge with a span of 108 ft. 6 in.; flanked by concrete viaduct approaches, at an estimated cost of about $62,000; and a half-through girder bridge, 84-ft. 2 in. span with concrete viaduct approaches, at an estimated cost of about $77,000. There are also six more highway bridges to be constructed, the details of which have not yet been announced.

The Pere Marquette has completed plans for a $7,500 heating plant for installation in its resort hotel at Charlevoix, Mich., in time for the opening of the hotel about July 1.

The St. Louis-San Francisco has awarded the contract for a new $800,000 hospital building to be erected at Springfield, Mo., to the William McDonald Trust Co., St. Louis.

The Southern Pacific has made plans for the rebuilding of its timber preservation plants at Wilmington and Oakland, Cal., the plant at Wilmington to have 4 retorts, each 6 ft. in diameter and from 117 to 132 ft. long with two operating tanks of a total capacity of 62,000 gal., storage tanks of 31,000 gal, capacity and an annual treating capacity of 673,000 ties. The plant at Oakland will have 3 retorts, each 18 ft. in diameter and 132 ft. long, with adzing and tie boring machines, 3 operating tanks having a total capacity of 195,000 gal., storage yards for 350,000 ties served by a 20-ton locomotive crane and an annual treating capacity of 7,500,000 board ft. of timber and 384,000 ties by the Rueping process as well as capacity for 625,000 ft. of piling by the dipping process. John D. Isaacs, consulting engineer, Southern Pacific, New York, is handling this work.

The Philadelphia & Reading has awarded a contract for the filling of its Ringtown, Pa., viaduct which will require of grading about 1,000,000 yards. A contract has been awarded to Bennett & Randall, Lebanon, Pa., for rebuilding a stone arch bridge north of Reading, Pa.

The Tuckaseegee & Southeastern has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line from Sylva to Blackwood, Jackson county, N. C., and also for authority to issue $300,000 of capital stock.

The Virginian & Western has applied to the Interstate Commerce Commission for authority for the construction of a line of 3.6 miles in Wyoming county, Virginia, to be leased to the Virginian, which has also applied for authority for the lease.

The Western Pacific, now owner of the Sacramento Northern, an electric line running from Sacramento to Chico, with branches to Oroville, Colusa and Woodland, and owner also of a line extending from Woodland to Fairfield, has begun surveys for an extension of approximately 42 miles from Woodland to Vacaville, and from the terminus on its tracks near Fairfield to the vicinity of Vallejo.

The Wichita Falls & Oklahoma has applied to the Interstate Commerce Commission for authority to construct a new line from the present terminus at the Texas-Oklahoma state line northeast to Waurika, Okla., 7½ miles, and a line from Byers, Texas, to the Oklahoma state line, 5.8 miles.

Equipment and Supplies

The Chicago, Burlington & Quincy has ordered from the American Bridge Company, 2,496 tons of structural steel for bridge work, and has ordered from the Fort Pitt Bridge & Iron Works, 2,130 tons of steel for a shop building at Denver, Colorado.

The Chicago Great Western is inquiring for steel rails with joints and fastening.

The Department of Docks, New York City, expects to come in the market soon for a large amount of equipment including railroad track materials, frogs and switches, for its Staten Island docks at St. George.

The Illinois Central is inquiring for 2,000 tons of tie plates.

The Lehigh Valley is inquiring for 700 tons of structural steel for a number of bridges.

The Missouri Pacific is inquiring for 164,000 angle bars and 2,000 kegs of track spikes.

The Nashville, Chattanooga & St. Louis has ordered 2,000 tons of rails from the Tennessee Coal Iron & Railroad Co.

The New York Central closed bids April 20 for 32,000 tons of rail.

The New York Central has awarded a contract to the McClintic-Marshall Company, Pittsburgh, Pa., for the 23,000 tons of structural steel for its Castleton bridge over the Hudson river near Albany, N. Y.

The South Manchurian Railway is inquiring through export houses in New York City for 8,000 tons of rail.

The Southern Pacific is inquiring for 20,000 kegs of spikes and bolts.

The Southern Pacific will install an electrically operated turntable, 100 ft. in length and weighing 183,000 lbs. at Siskiyou, Ore.

The Tennessee Central is inquiring for 7,000 tons of 80 lb. rails with joints and fastenings.

The Terminal Railway Association of St. Louis is inquiring for 75 track frogs.

The Texas & Pacific is inquiring for 50,000 tie plates to be used with 75 and 85-lb rails.

Efforts to Reduce Grade Crossing Accidents on the Central of Georgia have led this road to adopt an extensive program of advertising in newspapers, the plan being to present each month in all papers published in cities adjacent to the Central of Georgia's lines in Georgia, Alabama and Tennessee, statistics and other information to acquaint the public with the nature of the problem and to urge greater care on the part of automobile drivers, pedestrians and trespassers.

Supply Trade News

William E. Dougherty has joined the sales force at the Philadelphia, Pa., office of the Independent Pneumatic Tool Company, Chicago.

Charles S. Molley, vice president and general manager of the American Boron Products Company, Incorporated, Reading, Pa., died April 17.

The International Filter Company, Chicago, has moved its general offices from the First National Bank building to its works at 333 West Twenty-fifth place.

The Pennsylvania Pump & Compressor Company has opened a sales office at 105 W. Monroe street, Chicago, under the management of H. M. Montgomery.

Harvey E. Grace, vice president and treasurer of the William Grace Company, Chicago, railroad contractors, died suddenly on March 24, at his home in that city.

S. W. Linheimer, formerly vice president of the Walter A. Zelnicker Supply Company, St. Louis, Mo., has resigned from that company and has opened offices under his own name, at 428 First National Bank building, Chicago, as a dealer in second hand railroad equipment.

H. Fowler has been appointed district sales manager of the Cincinnati, Ohio, territory of the Carborundum Company, Niagara Falls, N. Y., succeeding **C. R. Cox.** The appointment will be effective July 1 when Mr. Cox will be transferred to the main office as sales statistician.

A. P. Blackstead, formerly chief engineer of the Camden Iron Works, Camden, N. J., and prior to that hydraulic engineer of the Henry R. Worthington Company, New York, has become associated with the engineering staff of the Dayton-Dowd Company, Quincy, Ill., manufacturers of centrifugal and fire pumps.

Knox Taylor, since 1910 president of the Taylor-Wharton Iron & Steel Company, High Bridge, N. J., died at his home in High Bridge, on April 4. He was born at High Bridge on October 19, 1873, and graduated from Princeton University in 1895. In January, 1902, he entered the service of the Taylor Iron & Steel Co. and worked up through various departments in the foundry and the old wheel shop until he became general manager in October, 1905. The High Bridge plant had been engaged in the production of manganese steel since 1892, under license of the Hadfield patents. In 1912 the company purchased all the interests of William Wharton, Jr. & Co., Inc., of Philadelphia, and its subsidiary, the Philadelphia Roll & Machine Co. The Wharton Company had originated the application of manganese steel in track work in co-operation with the old Taylor Iron & Steel Company, and the new combination became known as the Taylor-Wharton Iron & Steel Company. In 1913 the company also bought out the interests of the Tioga Iron & Steel Company, Philadelphia. During the war, Mr. Taylor, in addition to the work of his company's own contracts for gun forgings, helped supply railway track material for the American Expeditionary Forces. Mr. Taylor was a vice president of the Railway Business Association.

Knox Taylor

A. E. Nelson, district sales representative of the National Cast Iron Pipe Company, with headquarters at Kansas City, Mo., has been promoted to western sales manager, with headquarters at the main office in the Peoples Gas building, Chicago, succeeding **W. B. Neal,** who has resigned to accept a similar position with the Somerville Iron Works, Somerville, N. J., with headquarters at Chicago.

J. B. White, president and general manager of the Exchange Sawmills Sales Company, has been appointed chairman of the board of directors, with headquarters at Kansas City, Mo. **R. B. White,** assistant general manager, succeeds Mr. White as president and general manager, and F. R. **Watkins,** central sales manager, has been appointed secretary, succeeding A. T. Hemingway.

T. W. Barnes, who has been factory representative of the Baker R & L Company in the Chicago district for several years, and **W. F. Hebard,** national distributor of Buda industrial trucks, with headquarters in Chicago, have formed an organization under the name of W. F. Hebard & Company, to handle a complete line of Baker industrial tractors, trucks, cranes and specials in the Chicago territory.

C. J. McGregor, assistant sales agent of the American Steel & Wire Company, with headquarters at Cleveland, Ohio, has been promoted to sales agent, with headquarters at Buffalo, N. Y., succeeding **E. A. Niven,** who has been transferred to New York City. Mr. McGregor will be succeeded by **P. B. Gilroy,** who has been transferred from the Detroit office. Mr. McGregor has been in the service of this company for 20 years, first traveling in the New England territory for a period of 12 years, after which he was transferred to the Chicago, Ill., and Milwaukee, Wis., districts, where he remained for a year and eight months. He was made assistant sales agent at Cleveland in 1915, which position he was holding at the time of his recent promotion.

AIR REDUCTION SALES COMPANY TAKES OVER DAVIS-BOURNONVILLE COMPANY

The Air Reduction Sales Company, New York, has acquired all of the assets, including the patents, trade marks and trade names, of the Davis-Bournonville Company, Jersey City, N. J. This consolidation brings together two large companies whose histories have to a great extent been contemporaneous with the development of the oxyacetylene welding and cutting industry.

The Air Reduction Sales Company is a pioneer in the extraction of gases from the air for industrial use. Its principal product is oxygen, which is used to the greatest extent in conjunction with acetylene in producing the high temperature oxyacetylene flame. The company owns and operates 19 oxygen plants in important industrial centers, at which plants the gas is compressed into steel tanks for distribution through its plant and warehouse service system to the railways and other industries. The Air Reduction Sales Company also owns and operates 10 plants devoted to the manufacture of acetylene, in addition to which it owns a carbide plant, a welding and cutting equipment manufacturing plant and extensive research laboratories.

The Davis-Bournonville Company was organized in 1907 by Augustine Davis, Eugene Bournonville and C. B. Wortham, three years after Mr. Bournonville had received the first oxyacetylene torch to be introduced in the United States from his associate, Edmond Fouché, of Paris, who with Picard had developed this equipment. Messrs. Davis and Bournonville obtained the rights for the "Gauthier-Ely" positive pressure or medium pressure torch in the United States in 1907. As the practical value of the welding torch came to be realized this company also undertook the development of oxyacetylene cutting torches, acetylene generators and finally a line of patented machines for welding and cutting, which did much to save labor.

The merging of these companies brings to the Air Reduction organization all of the Davis-Bournonville products, including hand welding and cutting torches in a variety of styles and sizes, machine torches for welding and cutting, pressure regulators, lead-burning torches, carbon-burning outfits for use on motor car cylinders, acetylene generators, tube-welding machines and tube-fabricating equipment and other equipment. It is the intention of the Air Reduction Sales Company to continue the manufacture of this equipment which will be marketed under the name of Airco-Davis-Bournonville.

SAVE THE SURFACE AND INCREASE ILLUMINATION

Paint made with the New Jersey Zinc Company's

ZINC OXIDE and ALBALITH

accomplishes the maximum of two economies. It gives surfaces the greatest possible protection over the longest period—and delivers the most illumination whether the source of light is artificial or natural.

THE NEW JERSEY ZINC COMPANY

160 Front Street (Established 1848) New York City

Manufacturers of

Zinc Oxide, Albalith, Zinc Dust, Slab Zinc, Rolled Zinc, Spiegeleisen, C. P. Metallic Zinc, Zinc Sulphate, Mossy Zinc, Feathered Zinc, Sulphuric Acid, Salt Cake, Zinc Chloride

CHICAGO: Mineral Point Zinc Co., 1111 Marquette Building.
PITTSBURGH: The New Jersey Zinc Co. (of Pa.), 1439 Oliver Building.
CLEVELAND: The New Jersey Zinc Sales Co., 1138 Guardian Building.

New Jersey zinc

The World's Standard for Zinc Products

ESTABLISHED 1882

THE WEIR FROG CO.

Track Work of Rail and
Manganese Steel Construction

Manufacturers of Balkwill Articulated Cast Manganese Crossings

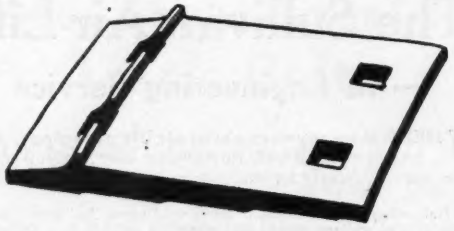
CINCINNATI - - - OHIO

The Frog, Switch & Manufacturing
Carlisle Company Pennsylvania

Established 1881

FROG AND SWITCH DEPARTMENT
MANUFACTURERS OF
MANGANESE INSERT FROGS, CROSSINGS
AND SPLIT SWITCHES
SOLID MANGANESE FROGS AND
CROSSINGS
PLAIN FROGS, SWITCHES, CROSSINGS
SWITCH STANDS AND ACCESSORIES

MANGANESE STEEL DEPARTMENT
MANUFACTURERS OF
"INDIAN BRAND"
HIGH GRADE MANGANESE STEEL CASTINGS
FOR FROGS, SWITCHES AND CROSSINGS
JAW AND GYRATORY CRUSHERS
CEMENT MILL, MINING MACHINERY, ETC.
GRAY IRON CASTINGS



The Lundie Tie Plate

The Lundie Tie Plate is widely acknowledged by railroad men having such plates in track, as promoting decided economy in rail wear, in holding track to gauge and in giving easy riding track. It will far more than pay for itself in reduction of Operating Expenses.

The features of the plate are—a sloping seat inclining the rail, so reducing abrasion and internal stresses in the rail to a minimum—a true camber promoting easy riding—and a bottom, as shown in the cut, so seating itself on the tie that the track is held firmly to gauge without injury to the tie.

The combination of these features, or their mechanical equivalent, is covered by Letters Patent, supported by other Patents covering certain individual features of the plate. Railroad companies pay no royalties on its authorized use.

The Lundie Engineering Corporation
920 Broadway, NEW YORK
Chicago Office, 30 North La Salle Street

Specialists
in the
Design and Manufacture
of

Standard—
Insulated—
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Rail Joints

The Rail Joint Company
61 Broadway New York City

Insure Your Track With Hipower

INSURANCE is the only recognized means of safeguarding against damage and loss of property. Why neglect your track when the premium is negligible compared to cost of purchase, construction and maintenance.

Ineffective Nut Locks are a liability. Nut Locks so designed and so made that they effectively and economically function are an asset—*yes we refer to*

HIPOWER NUT LOCKS

Due to their maximum effective pressures Hipower Nut Locks continuously and effectively hold splice bars in proper position, thereby retarding initial looseness of bolts, providing adequate resilience to absorb and diffuse shocks and compensating for wear of bolted parts and thus prolonging the life of the jointed parts and even the rail itself.

THE NATIONAL LOCK WASHER CO.

NEW YORK
NASHVILLE
RICHMOND

Established 1886
NEWARK, N. J.

DETROIT
ST. LOUIS
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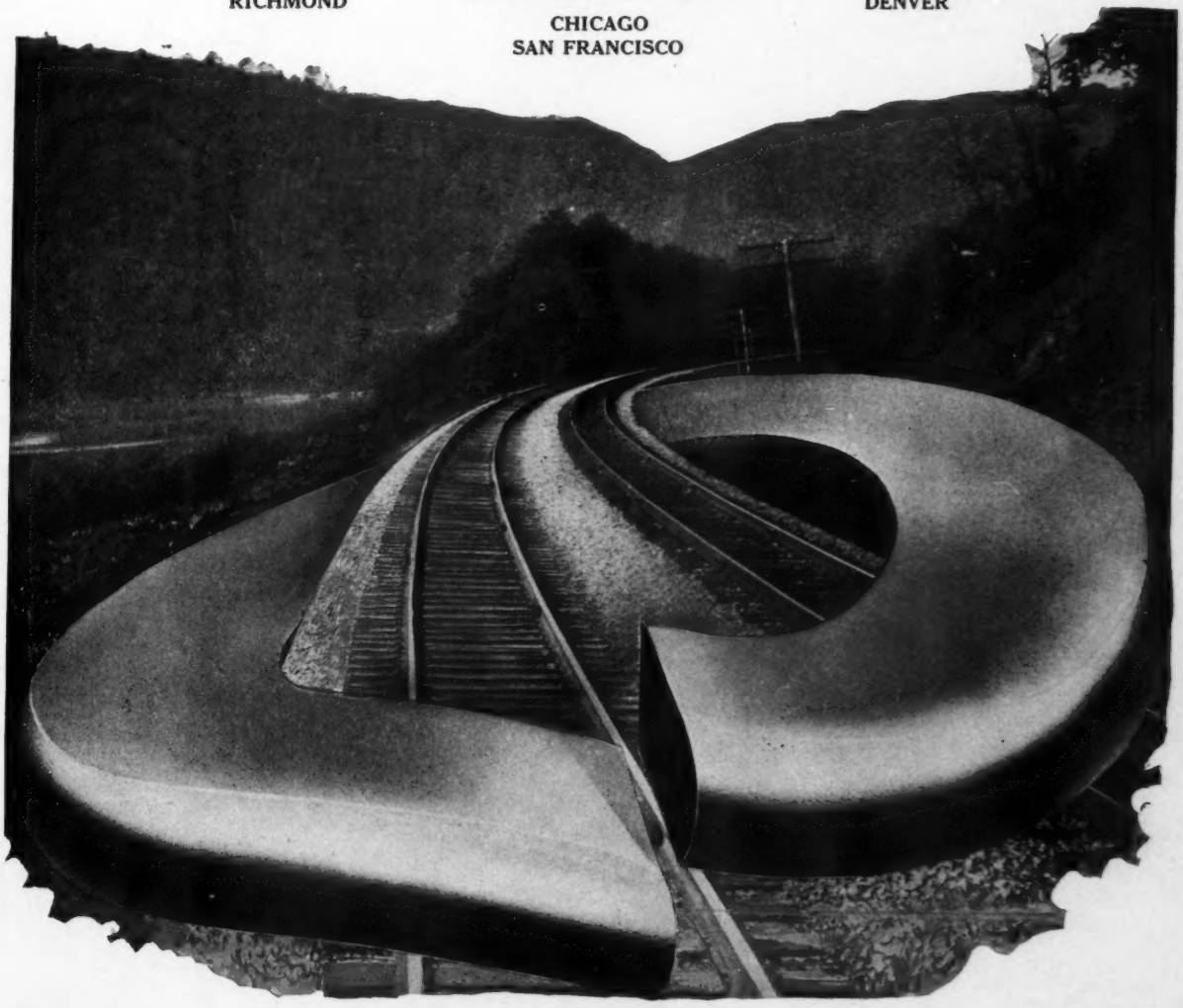

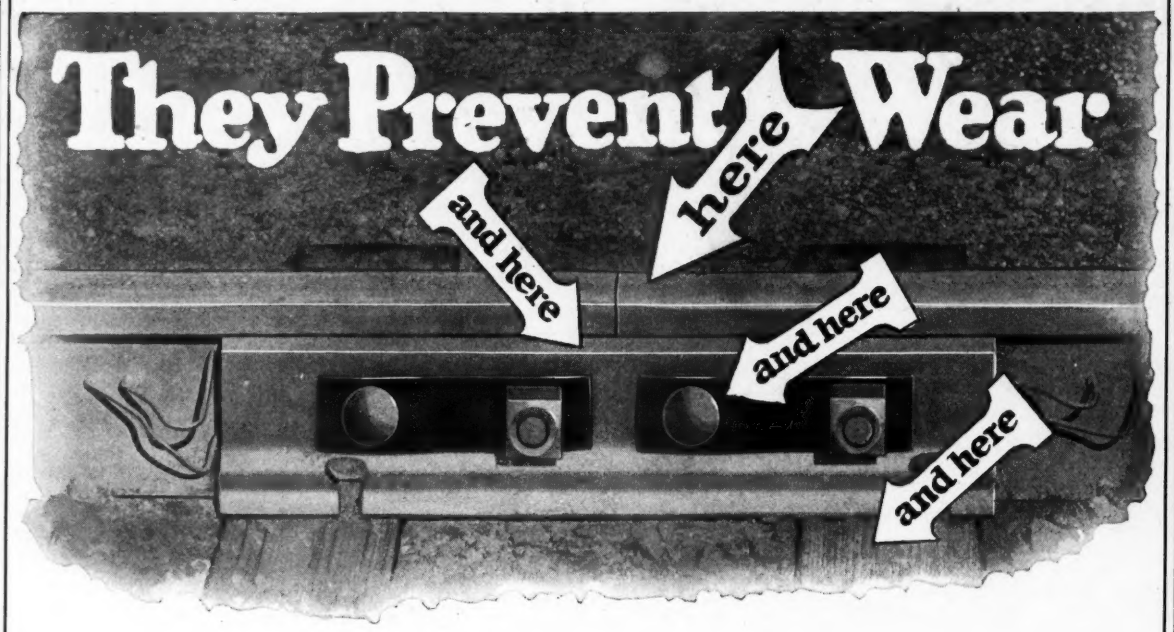

Strengthen your track at its weakest point!

—and reduce the cost of your joint maintenance. Most joint troubles start with loose bolts which eventually cause battered rail ends, worn angle bars and bolts, and tie abrasion.

Verona Rail Joint Springs prevent such conditions by automatically taking up the stretch in your bolts and the wear in your angle bars. They exert a reaction of 25,000 pounds as against the 4,000 pounds reaction of an ordinary nutlock. Even if a bolt should stretch a sixteenth of an inch, the spring would exert more reactive pressure than a nutlock that is fully compressed. They may be depended upon to rid your track entirely of loose bolts and their attendant wear.

Verona Rail Joint Springs

VERONA TOOL WORKS

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